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SPECIAL ISSUE: WELCOME TO CYBERSPACE

TIME

Special supplement to Time Issue-dated May 8

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From the Managing Editor

TIME JOURNALISTS, LIKE MOST OF THEIR KIND, ARE USED TO gathering facts from a variety of sources around the world. But reporting for this special issue on the cyberrevolution has been unusual. In addition to asking many outside experts about the impact of information technology on society, we found ourselves turning inward to tap the many experienced sources within our own company—indeed within our own magazine. Not only is Time Warner Inc., TIME's parent company, involved in a wide range of multimedia projects—such as the creation of a pioneering interactive television system in Orlando, Florida, and the establishment of its own site on the Internet—but TIME magazine has introduced its own brand of journalism into these new media forms.

For the past 18 months, each weekly issue of TIME has been available on the electronic newsstand of America Online, the fastest-growing of the commercial computer services. Since going online, our editors, writers and correspondents have been familiarizing themselves with yet another new journalistic venue: the ongoing exchange of real-time computer messages with our readers—friend and foe alike.

The learning continues. Early last year we inaugurated TIME Daily, an electronic news summary posted each weekday evening on AOL and, most recently, on Pathfinder, Time Warner's new home on the Internet's World Wide Web. Each week Pathfinder also offers Netsurfers a view of TIME's weekly contents, as well as a look at many other Time Inc. publications; it is getting more than 1.5 million "hits," or requests for additional documents or pictures, each week.

Our next step is participation in interactive television, which is a natural extension of our online work. TIME journalists will play a major role in providing the content for the News Exchange, a video information-on-demand feature on Time Warner's Full Service Network in Orlando, Florida, that will allow viewers to watch the news they want whenever they want it. A number of TIME staff members have already had to don makeup to tell their stories in front of a videocamera.

TV, once viewed as an enemy of print journalism, is fast becoming TIME's ally. In conjunction with this issue, we co-produced a one-hour program that aired in the U.S. April 5 on the Discovery Channel, covering much of the same material you see in these pages but presented in quite a different manner. The TV documentary, like TIME Daily and Pathfinder, is yet another way for us to bring first-rate journalism to as many people as possible—something we've been up to for more than 70 years.

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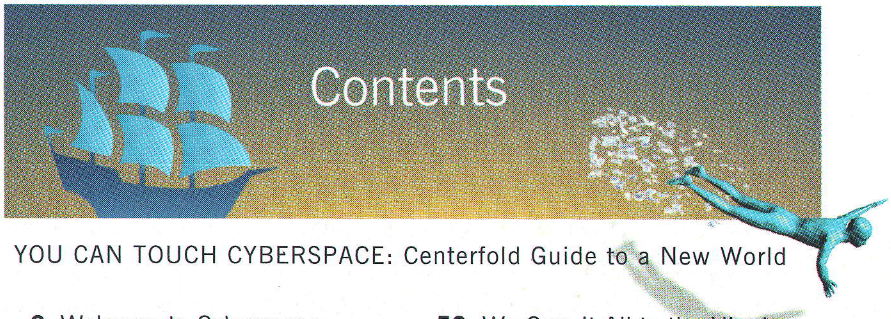

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Welcome to Cyberspace

What is it? Where is it? And how do we get there?

BY PHILIP ELMER-DEWITT

IT STARTED, AS THE BIG IDEAS IN TECHNOLOGY often do, with a science-fiction writer. William Gibson, a young expatriate American living in Canada, was wandering past the video arcades on Vancouver's Granville Street in the early 1980s when something about the way the players were hunched over their glowing screens struck him as odd. "I could see in the physical intensity of their postures how *rapt* the kids were," he says. "It was like a feedback loop, with photons coming off the screens into the kids' eyes, neurons moving through their bodies and electrons moving through the video game. These kids clearly *believed* in the space the games projected."

That image haunted Gibson. He didn't know much about video games or computers—he wrote his breakthrough novel *Neuromancer* (1984) on an ancient manual typewriter—but he knew people who did. And as near as he could tell, everybody who worked much with the machines eventually came to accept, almost as an article of faith, the reality of that imaginary realm. "They develop a belief that there's some kind of *actual space* behind the screen," he says. "Some place that you can't see but you know is there."

Gibson called that place "cyberspace," and used it as the setting for his early novels and short stories. In his fiction, cyberspace is a computer-generated landscape that characters enter by "jacking in"—sometimes by plugging electrodes directly into sockets implanted in the brain. What they see when they get there is a three-dimensional representation of all the information stored in "every computer in the human system"—great warehouses and skyscrapers of data. He describes it in a key passage in *Neuromancer* as a place of "unthinkable complexity," with "lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding . . ."

In the years since, there have been other names given to that shadowy space where our computer data reside: the Net, the Web, the Cloud, the Matrix, the Metaverse, the Datasphere, the Electronic Frontier, the information superhighway. But Gibson's coinage may prove the most enduring. By 1989 it had been borrowed by the online community to describe not some science-fiction fantasy but today's increasingly interconnected computer systems—especially the millions of computers jacked into the Internet.

Dive, layer by layer, through virtual worlds of business, education, politics, sex…

ILLUSTRATIONS FOR TIME BY OKO & MANO, INC.

They develop a belief that there's a kind of *actual space*

Now hardly a day goes by without some newspaper article, some political speech, some corporate press release invoking Gibson's imaginary world. Suddenly, it seems, everybody has an E-mail address, from Hollywood moguls to the Holy See. Billy Graham has preached on America Online; U.S. Vice President Al Gore has held forth on CompuServe; thousands chose to celebrate New Year's this year with an online get-together called First Night in Cyberspace.

In Washington cyberspace has become a political hot button of some potency, first pressed during the 1992 presidential campaign by Al Gore and Bill Clinton, who rode to the White House in part on the promise that they would build the so-called information superhighway and route it through every voter's district—if not to his home. But the Clinton Administration lost the high ground of cyberspace, having, among other transgressions, come out on the wrong side of the privacy debate when it endorsed the Clipper Chip security device favored by its intelligence services. The Republicans were quick to grab the initiative. No sooner had incoming House Speaker Newt Gingrich taken office than he made his bid, staging a big press conference to unveil a new House of Representatives computer system. At a Washington confab called "Democracy in Virtual America," attended by his old friends, futurists Alvin and Heidi Toffler, the Speaker talked expansively about wiring the world. "Cyberspace is the land of knowledge," proclaimed an information age Magna Carta issued in his name. "And the exploration of that land can be a civilization's truest, highest calling."

Corporations, smelling a land rush of another sort, are scrambling to stake out their own claims in cyberspace. Every computer company, nearly every publisher, most communications firms, banks, insurance companies and hundreds of mail-order and retail firms are registering their Internet domains and setting up sites on the World Wide Web. They sense that cyberspace will be one of the driving forces—if not the primary one—for economic growth in the 21st century.

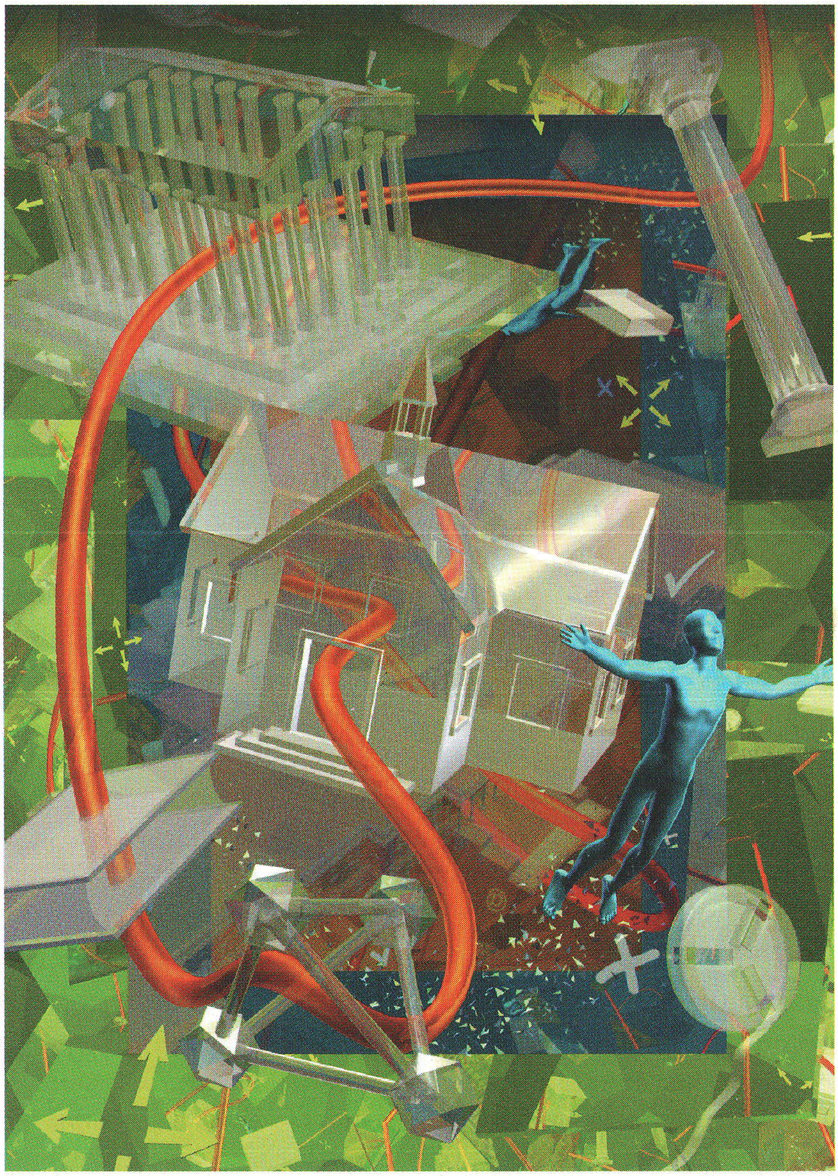
All this is being breathlessly reported in the press, which has seized on cyberspace as an all-purpose buzz word that can add sparkle to the most humdrum development or assignment. For working reporters, many of whom have just discovered the pleasures of going online, cyber has become the prefix of the day, and they are spawning neologisms as fast as they can type: cyberphilia, cyberphobia, cyberwonk, cybersex, cyberslut. A Nexis search of newspapers, magazines and television transcripts turned up 1,205 mentions o cyber in the month of January, up from 464 the previous January and 167 in January 1993.

ONE RESULT OF THIS DRUM ROLL IS A growing public appetite for a place most people haven't been to and are often hard-pressed to define. In a TIME/CNN poll of 800 Americans conducted in January by Yankelovich Partners, 57% didn't know what cyberspace meant, yet 85% were certain that information technology had made their life better. They may not know where it is, but they want desperately to get there. The rush to get online, to avoid being "left behind" in the information revolution, is intense. Those who find fulfillment in cyberspace often have the religious fervor of the recently converted.

These sentiments have been captured brilliantly in an IBM ad on U.S. TV showing a phalanx of Czech nuns discussing—of all things—the latest operating system from Microsoft. As they walk briskly through a convent a young novice mentions IBM's competing system called Warp. "I just read about it in *Wired*," she gushes "You get true multitasking . . . easy access to the Internet." An older sister glances up with obvious interest the camera cuts to the mother superior, who wistfully confesses, "I'm dying to surf the Net." Fade as the pager tucked under her habit starts to beep.

Cybernuns.

behind the screen that you can't see but know is there



A good deal of the Internet's content is tasteless, foolish,

What is cyberspace? According to John Perry Barlow, a rock-'n'-roll lyricist turned computer activist, it can be defined most succinctly as "that place you are in when you are talking on the telephone." That's as good a place to start as any. The telephone system, after all, is really a vast, global computer network with a distinctive, audible presence (crackling static against an almost inaudible background hum). By Barlow's definition, just about everybody has already been to cyberspace. It's marked by the feeling that the person you're talking to is "in the same room." Most people take the spatial dimension of a phone conversation for granted—until they get a really bad connection or a glitchy overseas call. Then they start raising their voice, as if by sheer volume they could propel it to the outer reaches of cyberspace.

CYBERSPACE, OF COURSE, IS BIGGER THAN a telephone call. It encompasses the millions of personal computers connected by modems—via the telephone system—to commercial online services, as well as the millions more with high-speed links to local area networks, office E-mail systems and the Internet. It includes the rapidly expanding wireless services: microwave towers that carry great quantities of cellular phone and data traffic; communications satellites strung like beads in geosynchronous orbit; low-flying satellites that will soon crisscross the globe like angry bees, connecting folks too far-flung or too much on the go to be tethered by wires. Someday even our television sets may be part of cyberspace, transformed into interactive "teleputers" by so-called full-service networks like the ones several cable-TV companies (including Time Warner) are building along the old cable lines, using fiber optics and high-speed switches.

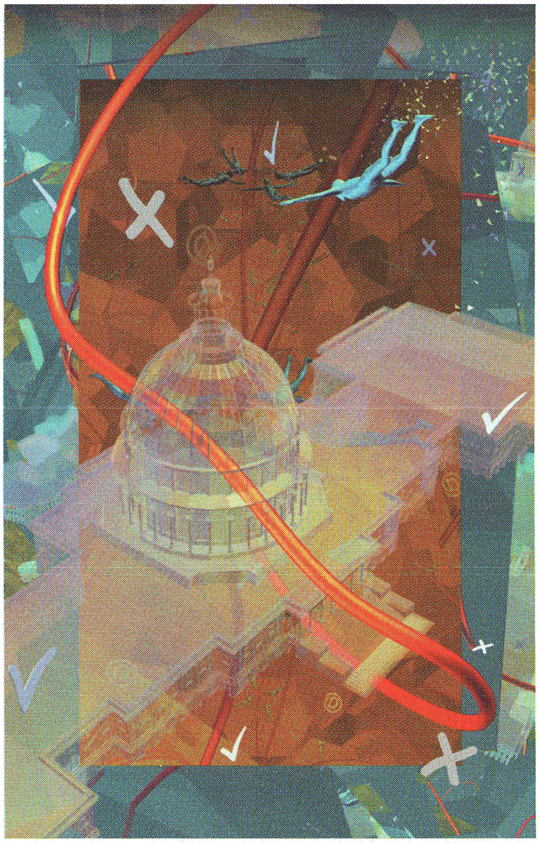
But these wires and cables and microwaves are not really cyberspace. They are the means of conveyance, not the destination: the information superhighway, not the bright city lights at the end of the road. Cyberspace, in the sense of being "in the same room," is an experience, not a wiring system. It is about people using the new technology to do what they are genetically programmed to do: communicate with one another. It can be found in electronic mail exchanged by lovers who have never met. It emerges from the endless debates on mailing lists and message boards. It's that bond that knits together regulars in electronic chat rooms and newsgroups. It is, like Plato's plane of ideal forms, a metaphorical space, a virtual reality.

But it is no less real for being so. We live in the age of information, as Nicholas Negroponte, director of the Massachusetts Institute of Technology's Media Lab, is fond of pointing out, in which the fundamental particle is not the atom but the bit—the binary digit, a unit of data usually represented as a 0 or 1. Information may still be delivered in magazines and newspapers (atoms), but the real value is in the contents (bits). We pay for our goods and services with cash (atoms), but the ebb and flow of capital around the world is carried out—to the tune of several trillion dollars a day—in electronic funds transfers (bits).

Bits are different from atoms and obey different laws. They are weightless. They are easily (and flawlessly) reproduced. There is an infinite supply. And they can be shipped at nearly the speed of light. When you are in the business of moving bits around, barriers of time and space disappear. For information providers—publishers, for example—cyberspace offers a medium in which distribution costs shrink to zero. Buyers and sellers can find each other in cyberspace without the benefit (or the expense) of a marketing campaign. No wonder so many businessmen are convinced it will become a powerful engine of economic growth.

At this point, however, cyberspace is less about commerce than about community. The technology has unleashed a great rush of direct, person-to-person communications, organized not in the top-down, one-uninteresting or just plain wrong. And it's habit forming

to-many structure of traditional media but in a many-to-many model that may—just may—be a vehicle for revolutionary change. In a world already too divided against itself—rich against poor, producer against consumer—cyberspace offers the nearest thing to a level playing field.



Take, for example, the Internet. Until something better comes along to replace it, the Internet *is* cyberspace. It may not reach every computer in the human system, as Gibson imagined, but it comes very close. And as anyone who has spent much time there can attest, it is in many ways even stranger than fiction.

Begun more than 20 years ago as a U.S. Defense Department experiment, the Internet escaped from the Pentagon in 1984 and spread like kudzu during the personal-computer boom, nearly doubling every year from the mid-1980s on. Today 30 million to 40 million people in more than 160 countries have at least E-mail access to the Internet; in Japan, New Zealand and parts of Europe the number of Net users has grown more than 1,000% during the past three years.

One factor fueling the Internet's remarkable growth is its resolutely grass-roots structure. Most conventional computer systems are hierarchical and proprietary; they run on copyright software in a pyramid structure that gives dictatorial powers to the system operators who sit on top. The Internet, by contrast, is open (nonproprietary) and rabidly democratic. No one owns it. No single organization controls it. It is run like a commune with 4.8 million fiercely independent members (called hosts). It crosses national boundaries and answers to no sovereign. It is literally lawless.

Although graphics, photos and even videos have started to show up, cyberspace, as it exists on the Internet, is still primarily a text medium. People communicate by and large through words, typed and displayed on a screen. Yet cyberspace assumes an astonishing array of forms, from the utilitarian mailing list (a sort of junk E-mail list to which anyone can contribute) to the rococo MUDS, or Multi-User Dungeons (elaborate fictional gathering places that users create one "room" at a time). All these "spaces" have one thing in common: they are egalitarian to a fault. Anybody can play (provided he or she has the requisite equipment and access), and everybody is afforded the same level of respect (which is to say, little or none). Stripped of the external trappings of wealth, power, beauty and social status, people tend to be judged in the cyberspace of the Internet only by their ideas and their ability to get them across in terse, vigorous prose. On the Internet, as the famous *New Yorker* cartoon put it, nobody knows you're a dog.

Nowhere is this leveling effect more apparent than on Usenet—more than 10,000 discussion groups (called newsgroups) distributed over the Internet and devoted to every conceivable subject, from conservative U.S. talk-show host Rush Limbaugh to particle physics to the nocturnal habits of ring-tailed lemurs.

It's as if some grim fallout shelter had burst open and a

The newsgroups develop their own peculiar dynamic as participants lurch from topic to topic—quick to take and give offense, slow to come to any kind of resolution.

But Usenet regulars are fiercely proud of what they have constructed. They view it as a new vehicle for wielding political power (through mass mailings and petitions) and an alternative system for gathering and disseminating raw, uncensored news. If they are sometimes disdainful of bumbling "newbies" who go online without learning the rules of the road, they are unforgiving to those who violate them deliberately. Many are convinced that the unflattering press accounts (those perennial stories about Internet hackers and pedophiles, for example) are part of a conspiracy among the mainstream media to suppress what they perceive as a threat to their hegemony.

THE USENET NEWSGROUPS ARE, IN THEIR way, the perfect antidote to modern mass media. Rather than catering to the lowest common denominator with programming packaged by the few and broadcast to the many, the newsgroups allow news, commentary and humor to bubble up from the grass roots. They represent narrowcasting in the extreme: content created by consumers for consumers. While cable-TV executives still dream of hundreds of channels, Usenet already has thousands. The network is so fragmented, in fact, that some fear it will ultimately serve to further divide societies already splintered by race, politics and sexual prejudice. That would be an ironic fate for a system designed to enhance communications.

The Internet is far from perfect. Largely unedited, its content is often tasteless, foolish, uninteresting or just plain wrong. It can be dangerously habit-forming and, truth be told, an enormous waste of time. Even with the arrival of new point-and-click software such as Netscape and Mosaic, it is still too hard to navigate. And because it requires access to both a computer and a high-speed telecommunications link, it is out of reach for millions of people too poor or too far from a major communications hub to participate.

But it is remarkable nonetheless, especially considering that it began as a cold war postapocalypse military command grid. "When I look at the Internet," says Bruce Sterling, another science-fiction writer and a great champion of cyberspace, "I see something astounding and delightful. It's as if some grim fallout shelter had burst open and a full-scale Mardi Gras parade had come out. I take such enormous pleasure in this that it's hard to remain properly skeptical."

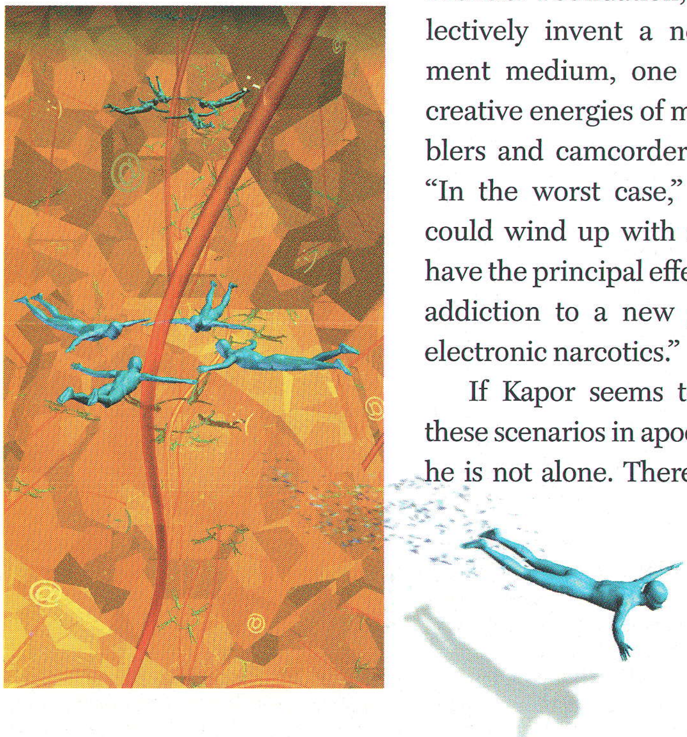
There is no guarantee, however, that cyberspace will always look like this. The Internet is changing rapidly. Lately a lot of the development efforts—and most of the press attention—have shifted from the rough-and-tumble Usenet newsgroups to the more passive and consumer-oriented "home pages" of the World Wide Web—a system of links that simplifies the task of navigating among the myriad offerings on the Internet. The Net, many old-timers complain, is turning into a shopping mall. But unless it proves to be a total bust for business, that trend is likely to continue.

The more fundamental changes are those taking place underneath sidewalks and streets, where great wooden wheels of fiber-optic cable are being rolled out one block at a time. Over the next decade, the telecommunications systems of the world will be rebuilt from the ground up as copper wires are ripped up and replaced by hair-thin fiber-optic strands.

The reason, in a word, is bandwidth, the information-carrying capacity of a medium (usually measured in bits per second). In terms of bandwidth, a copper telephone wire is like a thin straw, too narrow to carry the traffic it is being asked to bear. By contrast, fiber-optic strands, although hair-thin, are like great fat pipes, with an intrinsic capacity to carry tens of thousands of times as many bits as copper wire.

full-scale Mardi Gras parade had come tumbling out

It's not just the Internet surfers who are crying for more bandwidth. Hollywood needs it to deliver movies and television shows on demand. Video game makers want it to send kids the latest adventures of Donkey Kong and Sonic the Hedgehog. The phone companies have their eyes on what some believe will be the next must-have appliance: the videophone.



There is a broad consensus in U.S. government and industry that the National Information Infrastructure, as the Clinton Administration prefers to call the info highway, will be a broadband, switched network that could, in theory, deliver all these things. But how it will be structured and how it will be deployed are not so clear. For example, if cable-TV and telephone companies are allowed to roll out the new services in only the richest neighborhoods—a practice known as "cream skimming"—that could exacerbate the already growing disparity between those who have access to the latest information and the best intelligence and those who must be content with what they see on TV.

An even trickier question has to do with the so-called upstream capacity of the network. Everybody wants to build a fat pipeline going into the home; that's the conduit by which the new information goods and services will be delivered. But how much bandwidth needs to be set aside for the signal going from the home back into the network? In some designs that upstream pathway is quite narrow—allowing just enough bits to change the channel or order a zirconium ring. Some network activists argue that consumers will someday need as much bandwidth going out of the home as they have coming in. Only then can ordinary people become, if they choose, not just consumers of media but producers as well, free to plug their camcorders into the network and broadcast their creations to the world.

How these design issues are decided in the months ahead could change the shape of cyberspace. Will it be bottom up, like the Internet, or top down, like broadcast television? In the best case, says Mitch Kapor, cofounder (with John Perry Barlow) of the Electronic Frontier Foundation, we could collectively invent a new entertainment medium, one that taps the creative energies of midnight scribblers and camcorder video artists. "In the worst case," he says, "we could wind up with networks that have the principal effect of fostering addiction to a new generation of electronic narcotics."

If Kapor seems to be painting these scenarios in apocalyptic terms, he is not alone. There is something about cyberspace that sets people's imaginations blazing. Much of what has been written about it—in the press and on the networks—tends to swing from one extreme to the other, from hype and romanticism to fear and loathing. It may be that the near-term impact of cyberspace is being oversold. But that does not mean that real change isn't in the works. As a rule of thumb, historians say, the results of technological innovation always take longer to reach fruition than early champions of change predict. But when change finally comes, its effect is likely to be more profound and widespread and unanticipated than anyone imagined—even the guys who write science fiction. ■

Strange Sounds And Sights

Musicians and artists are redefining their work by embracing the computer—and shaking up the world of culture

By GINIA BELLAFANTE

WITH SHOULDER-LENGTH red dreadlocks and an intense gaze, Jaron Lanier is a striking presence, even in the strange universe of performance art. But then he does nothing so routine as, say, recite sonnets while cartwheeling nude across a stage. Lanier is a virtual-reality performance artist. In his piece, *The Sound of One Hand,* which has played to packed theaters in Chicago, Toronto and Linz, Austria, he appears onstage framed by the image of a virtual world he enters when he dons special goggles and a DataGlove. His audience sees what he sees—and what he does, which is bend and stretch like some contorted stork. His movements elicit eerie, tinkling notes from the computer-generated virtual instruments he is playing: a Cybersax, a CyberXylo and a Rhythm Gimbal.

Lanier is in familiar territory: he is widely considered to be the father of virtual reality. Though his name is not yet common fare on the cocktail-party circuit of the cultural élite, he is a star of an astoundingly energized new movement of musicians and visual artists who are defining and redefining their work through the use of cybertechnology. "The computer is now an accepted tool," says David Ross, director of New York City's Whitney Museum of Contemporary Art. "In the art world, it is no longer an issue." From the fashionably bohemian precincts of lower Manhattan to London and Los Angeles, the cultural world abounds with computer-aided musicians, CD-ROM virtuosos, painters, photographers and digital artists who are building their own galleries in cyberspace—all in addition to the digitally savvy filmmakers who have already transformed cinema.

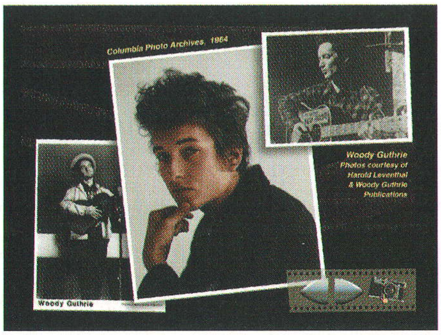
Lanier embodies a whole new genre of music that uses computers to create and disseminate its own distinctive sounds. Another practitioner on the rise is Italian astrophysicist Fiorella Terenzi, 30, who has been described as a cross between Madonna and Carl Sagan. Terenzi has used audio telescopes to intercept radio waves from a galaxy 180 million light-years away, then fed them into a computer, applied a sound-synthesis program to convert her data into music and produced *Music from the Galaxies.* Result: part New Age, part *Buck Rogers* sound track, played on an oscilloscope.

The Future Sound of London, one of Britain's trendiest club bands, performed "live" last November at the Kitchen in New York City—while physically remaining in its studio on Chapter Road in Dollis Hill, London. The group's banks of synthesizers and samplers, as well as its three-dimensional silicon graphics, were wired through the Internet to speakers and screens 8,000 km away. The band members promise that within 18 months they will produce a 3-D film of themselves performing in a virtual environment.

Piqued by the possibilities of a new medium, Old Guard rockers are seeking to reinvent themselves cyber-electronically. A foray into the techno-arts has not only revived but enhanced the career of once forgotten pop singer Thomas Dolby. Last year his Virtual String Quartet—a 3-D imaging project in which people played computerized instruments in virtual space—found its way to the SoHo Gallery of the Guggenheim Museum in New York City. Other performers, such as Bob Dylan, Peter Gabriel and Todd Rundgren, are venturing into the rapidly growing territory of CD-ROM, which takes the present CD a step further by adding visuals. Dylan's newly released *Highway 61 Interactive* serves as an elaborate audiovisual historiography. Besides 10 Dylan songs and four videos, it features an electronic scrapbook that includes the singer's high school photos.

CD-ROMS like Gabriel's *Xplora* and Rundgren's *No World Order* invite viewers/listeners to reassemble images and change tempo and mood, customizing tracks to their own tastes. One of Gabriel's projects, *Eve,* will allow users to remix sampled sounds while creating their own screen environment from images provided by four collaborating visual artists. While some in the arts might flinch at the notion of forfeiting control of their work, Gabriel champions the idea. "The point is to put people inside the work of artists in such a way that they can explore it and eventually become artists themselves," he says. "The CD-ROM is the first practical, tangible step along that road." Interactivity, he hopes, "will destroy the élite divide between those who can create and those who can't."

Such artistic egalitarianism is a guiding principle on the World Wide Web, which has become the Internet's showcase for visual imagery. Any artist can display his or


Columbia Photo Archives, 1964
Woody Guthrie
Photos courtesy of Harold Leventhal & Woody Guthrie Publications
Woody Guthrie

GRAPHIXZONE

CHRIS WADE FOR TIME

THE TIMES THEY ARE A-CHANGIN': Virtual reality's progenitor, Jaron Lanier, right, plays his cyberinstruments; Bob Dylan goes CD-ROM, left, with *Highway 61 Interactive*

her images—whether paintings, photos, sketches or other forms—to thousands of viewers at little cost beyond that of a modem and the requisite software to get on the Net. In essence, the Web offers a virtual mall of galleries, each featuring round-the-clock exhibitions, minus the jug wine. Hoping for recognition, some struggling artists scan in reproductions of their work, while others display more complex, computer-developed art.

A host of budding Cézannes may yet emerge from the Web's galleries, but for now much of the work remains amateurish. "I haven't been blown away by the online art I've seen," says Sarah Bayliss, the U.S. editor of *World Art*, a new quarterly focusing on emerging artists and electronic media. "A lot of people online are very optimistic; they have an uncynical attitude. And that is what encourages really bad art. This 'anyone can be an artist' mind-set is one of the most dangerous things we're seeing."

Part of the problem, contend cyber-aesthetes, is that there are no established criteria for judging Net art. "The real issue is how you find, develop and enforce standards in a brave new world," says the Whitney's Ross. "Eventually more critics will begin to develop a vocabulary to say something meaningful about what they're seeing, and critical dialogue will help shape standards. But we're a generation away from that."

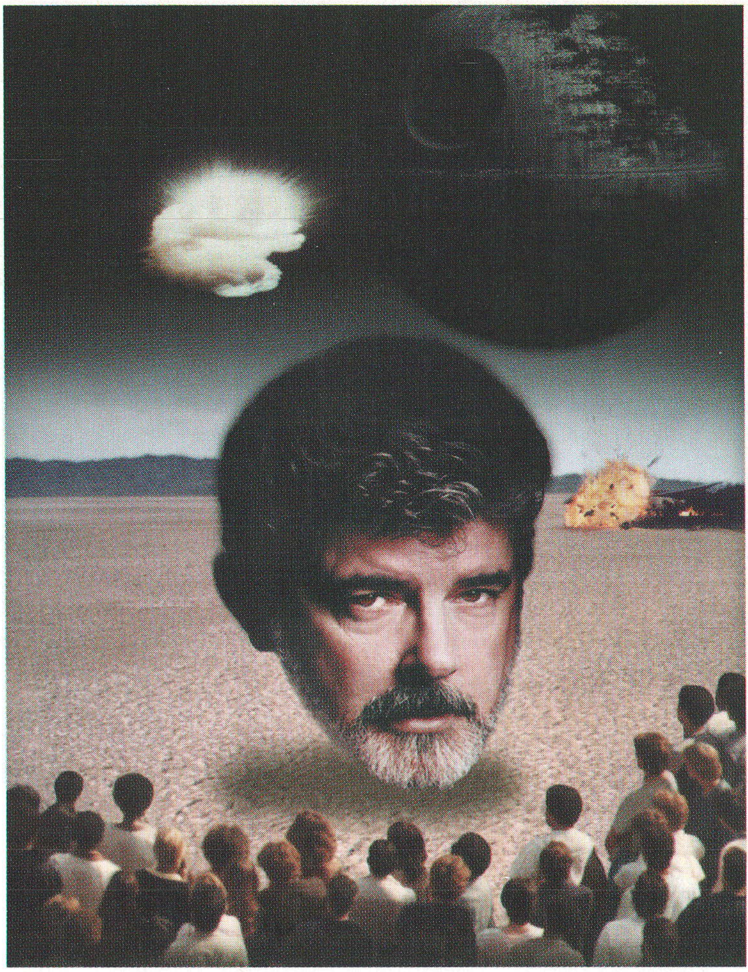


PHOTO ILLUSTRATION FOR TIME BY WILLIAM DUKE; EXPLOSIONS AND DEATH STAR COURTESY INDUSTRIAL LIGHT AND MAGIC

STAR POWER: George Lucas works award-winning cinematic wizardry at his Industrial Light & Magic studio; astrophysicist Fiorella Terenzi, right, composes computerized music with an ear to the heavens

THE BEST WEB ART SO FAR HAS been created by computers and designed specifically for them. These are works that would have no place in a traditional gallery or museum. Ross considers the work of conceptual artist Antonio Muntades a paragon of excellence in computer art. Muntades' *File Room* is an ongoing interactive dialogue on censorship featuring images, biographies and discussions of controversial artists like Robert Mapplethorpe and Annie Sprinkle. The Website *CitySpace*, co-developed by Los Angeles artist Coco Conn and the Ontario Science Center, features virtual metropolises in which visitors may add doors, freeways and parks.

In this maze of infinite gallery space, where little is for sale yet, even the best artists must figure out how they will survive. Ross envisions a world where Websites are bestowed on worthy artists, who in turn charge visitation fees. In that scheme, an artist might receive a Website as he would a grant and then put himself in business. Since popular Websites are visited tens of thousand of times a day, he could conceivably make a pretty good living by charging just 25¢ a visit.

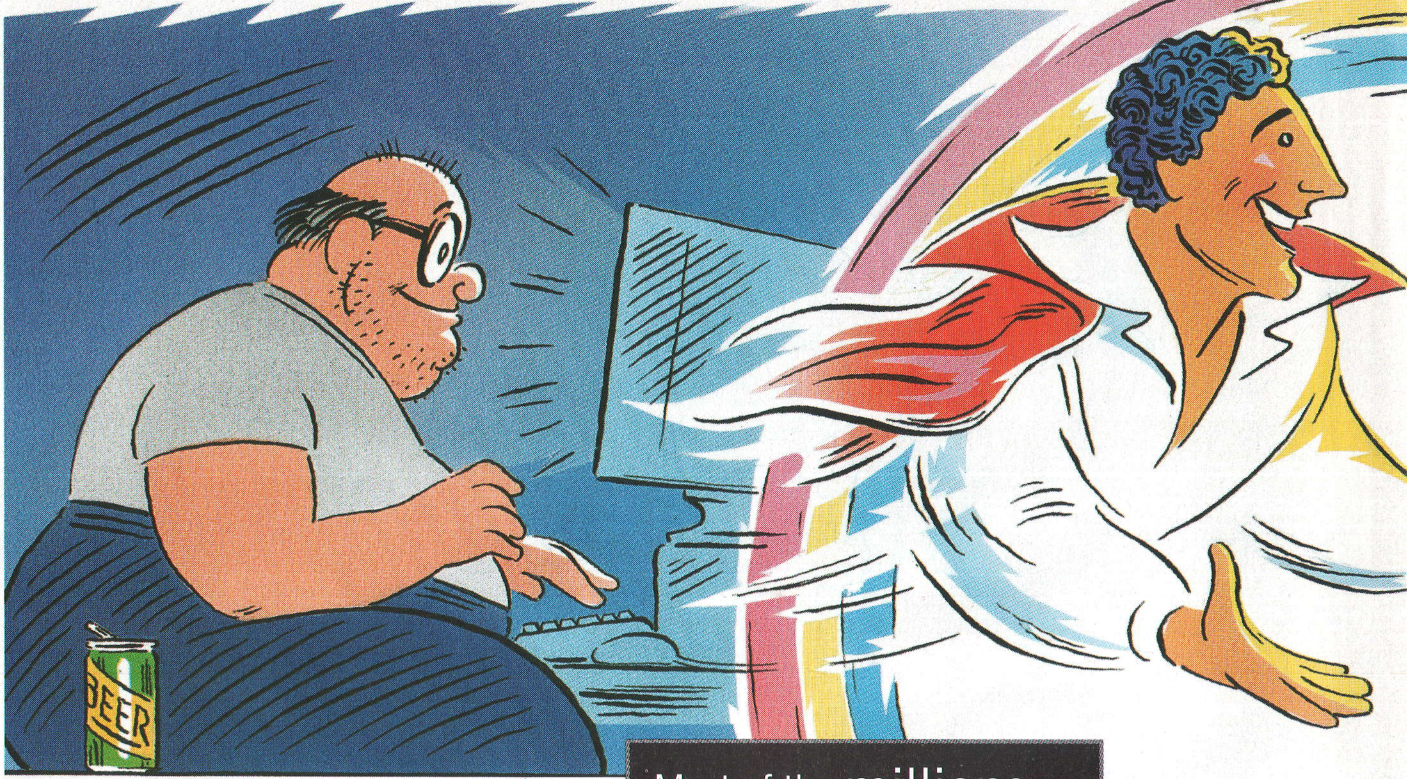
Until the mechanics of such a system are worked out and an élite cadre of cyberartists emerges, the most visible pieces of art will be the digitally reproduced museum masterpieces put online by patrons like Microsoft's Bill Gates. His newly formed company, Continuum Productions, is collecting the digital rights to many of the great works of art and creating electronic coffee-table books, available now on CD-ROMS and eventually on networks. Similarly, a mini-Louvre Website exists on the Net, allowing visitors to call up a grainy version of works such as Monet's *Pont Neuf*. Some in the real (as opposed to virtual) art world are concerned that on-screen viewing will deter actual museumgoing. Counters Markos Kounalakis of San Francisco's Visible Interactive Corp., which produces high-tech interactive museum tours: "Most people understand the difference between viewing a masterpiece with the help of a modem and viewing the real thing at a museum."

The experience that most people associate with computerized art is seeing a movie with elaborate, special effects displayed on the big screen. Many of today's most spectacular images are the result of artful digital technology developed at filmmaker George Lucas' studio, Industrial Light & Magic. ILM has revolutionized filmmaking with the kind of digital tricks seen in movies like *Forrest Gump*, *Wolf* and *The Mask*.

By digitizing images and manipulating tiny pixels of information, veteran artist-programmers of the Lucas school can achieve almost any effect. "Right now, the only limit is money," says Lucas. "We can even create actors. It's just extremely expensive." The results, however, are impressive enough to draw millions of moviegoers worldwide—and earn more than enough to pay for the work.

As old hat as computer-created film effects may have become, they are indicative of the kind of polish and growth that may yet emerge from newer, more experimental digitized art forms. "The predictions for change in the information environment are as profound as they were during the television revolution," says the Whitney's Ross. "We all know we are walking into a dark and foggy room." It is not for the first time. In 1902, Alfred Stieglitz, Edward Steichen and other now venerated American photographers formed a group devoted to convincing doubters that photography was a worthy form of artistic expression. That goal took decades to achieve. ***—With reporting by Hannah Bloch/New York, Michael Brunton/London, Patrick E. Cole/Los Angeles and David S. Jackson/San Francisco***

PHOTOGRAPH BY MICHAEL LLEWELLYN FOR TIME



Intimate Strangers

Most of the millions of online users are there to keep company in a world where they can be whoever they want to be—up to a point

By JILL SMOLOWE

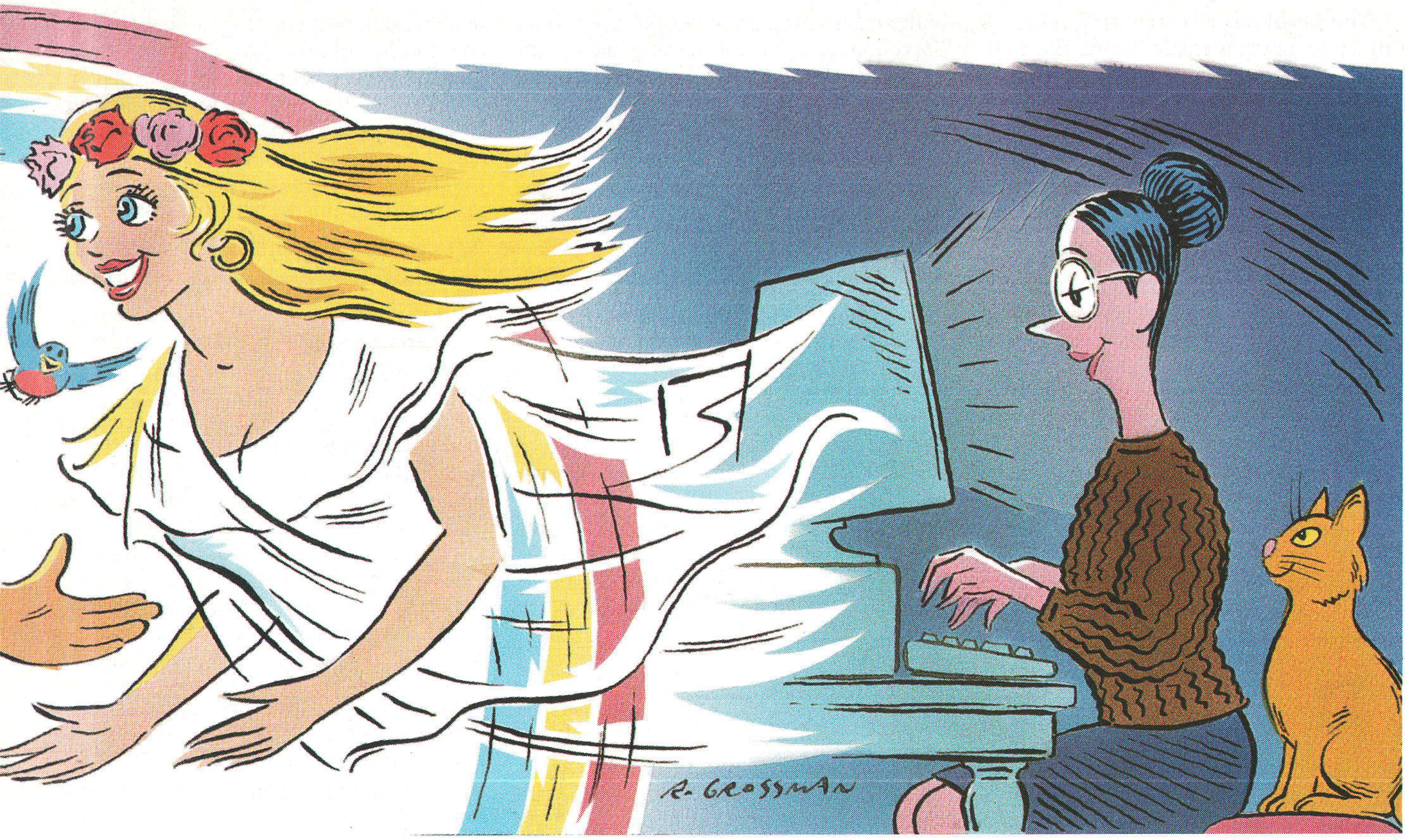
WHEN SHE FIRST JOINED ECHO, a U.S. East Coast electronic community, Marisa Bowe dubbed herself "Miss Outer Boro 1991," a handle that facetiously implied beauty queen–like poise, glamour, congeniality. And soon enough, Bowe was enjoying the adulation of fellow "ECHOids" who posted messages praising her wit, candor and smarts. Such celebrity was heady stuff for Bowe, a freelance writer who describes herself in real life as shy and wary of emotional encounters. "I became addicted to this constant stream of approval," she says. "It was like a big co-dependency machine."

As Bowe began spending up to 100 hours a month online, however, her life began to take on the burdens of celebrity. "Some people were envious of me," she says. "They accused me of snobbery and élitism." More disturbing, Bowe began to realize that her own hyperactivity was masking an underlying unhappiness with her life. So she dropped out of ECHO, cold turkey. "I had forgotten that the real world is so complex and fascinating."

She's back in cyberspace now, this time in a paid position at ECHO overseeing its 54 conferences, but she has learned to navigate online with greater perspective and a thicker skin. That doesn't mean she's become detached, though. "This is an emotional place, not just a communications device," she says.

All of this may sound strangely overwrought to those who have yet to venture online. The Internet, after all, has been touted largely as an unwalled repository of raw data, not of raw emotions. But the truth is that the vast majority of people who troll the Internet's byways are there in search of social interaction, not just sterile information. An estimated 80% of all users are looking for contact and commonality, companionship and community—all the conjugations implied by E.M. Forster's famous injunction "Only connect!"

Relationships can be complicated in cyberspace because the very technology that draws most people together also keeps them apart. Over time, the safe sense of distance that initially seems so liberating to newcomers on the Net can become an obstacle to deepening the bonds of friendship, romance and community. At some



ROBERT GROSSMAN FOR TIME

point, most networkers often find, the only real way to move a relationship forward is to risk personal contact—and then hope the phantom bond will hold up in the 3-D world. "You can't lead a total life online," says Dave Hughes, founder of the Old Colorado City Electronic Cottage, a cybersettlement. "But if it's done right, online communication can lead *to* face-to-face contact, not away *from* it."

At its best, the sprawling Internet brings together people with mutual interests who, for reasons ranging from geography to social and income disparity, would otherwise never have met. These virtual friendships can lead to physical encounters that may cement lifelong relationships. "The cybercommunity is not separate from your community of friends; it's just not geographically local," says Carolyn Ybarra, an anthropology Ph.D. candidate at Stanford University.

When Ybarra moved west from Minneapolis, her online quilting group threw an in-person farewell party. Since then, she has become good friends with two of her fellow quilters, keeping in constant touch online. "I feel just as close to these women as I do to my college friends," she says. "I tell them more up-to-date details of my personal life, more often, because their response is so quick."

Ybarra was fortunate to encounter women who, in person, were much the same as they were online. That is often not the case. The disembodied voices that whisper through cyberspace can often be manufactured identities that can disguise, distort or amplify aspects of a user's personality. Fortunately, only a relative few—Lotharios who woo indiscriminately, for example, or pederasts who prey on vulnerable children—have a devious and potentially dangerous intent.

MOST NET USERS ARE MORE likely to project aspects of the person they wish they could be. Paulina Borsook, author of *Love over the Wires*, calls this "selective lying by omission"; psychologist Kenneth Gergen, author of *Saturated Self*, more charitably regards it as "playing out our other selves."

Either way, even unintended distortions can prove bruising. When Christine Rance, 28, struck up a Net relationship with a man she knew as "MyPalJoey," she says, "I told him things I had never told anyone in my life. I was really able to be more open. He was too."

After more than three months of furious messaging, the couple had their first F2F (face-to-face) encounter. About six months later, Rance secured a job transfer from Chicago to San Francisco, anticipating a trip to the altar. But after six weeks, the couple broke up, crushed by conflicting schedules and personalities. "He's a very selfish person, more than I ever thought," says a chastened Rance. "He didn't want to give up anything but wanted me to give up everything."

Dan Marsh, by contrast, knew within five minutes of his first F2F with Audrey that their four years of online messaging between the West Coast and Pennsylvania had been time well invested. "I don't react well to meeting people in person," says Marsh. "I'm very reserved." But the relative safety of cyberspace had enabled him to be more trusting and vulnerable. "Even though I'm the most private person you ever want to meet, I let my guard down right away," he says of their online courtship. In 1993, two years after meeting, the couple married.

Veteran settlers often establish exclusive conferences to avoid beginners' bellyaching

The problems of cementing relationships in cyberspace pale beside the challenges of forging whole enclaves. In fact, among the cyberintelligentsia, debate rages as to whether the concept of "community" even exists in cyberspace. Howard Rheingold, author of *The Virtual Community*, says, "I want to dispel the notion that a computer network is by itself a community—a place where at least some of the people reach out through that screen and affect each other's lives." At some point, Rheingold says, "it requires a further commitment either in real life or in cyberspace from those people to each other."

"I told him things I had never told anyone. He was able to be more open too." Later the couple had their first F2F

Rheingold cites the death from cancer last August of Kathleen Johnston, a member of the WELL, a nine-year-old San Francisco–area settlement. Not only did many of the WELL's more than 10,000 subscribers flood Johnston in her waning days with electronic support, consolation and advice, but more than two dozen members took turns going to her home, tending to her needs. "Not dying alone," says Rheingold, "that's something a community has." Some found that the feeling of shared loss—even if not shared directly with others—was enough to forge a sense of community.

WELL member Jon Carroll, who participated in the electronic support, believes "cyberspace entered the real world in a real way with her death." In his view, virtual communities often enjoy a keener sense of connection than physical communities. "Since they are in cyberspace voluntarily," says Carroll, "people are far more interested in participating in the life of the community online."

That view is not universal. "We need to be critical of the use of the word community," counters Steven Jones, editor of *CyberSociety*, a new collection of essays on computer-mediated communications. "If we use the term uncritically, we dilute it in ways that really count." To Jones, community implies not only responsibility, respect and acceptance of the consequences of one's actions but also simply "being together," without any agenda. He regards the urge to form cybercommunities as a throwback to the '60s. "We tune in, turn on, drop out, make our own rules, man," he says. "This is not real."

Denizens of virtual villages respond that what they have constructed is as real as anything three-dimensional. "The online world is not utopia," says ECHO founder Stacy Horn. "We take all our problems, needs, strangeness, biases and prejudices online with us." In short, members take themselves along for the ride. "People who have troubles with their friends in the real world think they'll come online and have lots of friends, and it's not true," says Horn. "They have equal trouble establishing friendships in cyberspace."

IN MOST ONLINE COMMUNITIES, THE esprit is fiercely democratic. When crises arise, they are resolved by members thrashing out the dos and don'ts of cyberspace etiquette. Still, there are plenty of élites and hierarchies. Veteran settlers, who look askance at the hordes of newcomers, often form exclusive conferences where they can avoid endless beginner bellyaching about insiderish jokes and jargon. "There are users and superusers," says Jones. "There are E-mail addresses that have more status than others."

In other words, the Net is pretty much more of the world we already know: a place both embracing and exclusionary, loving and hurtful. As happened with the telephone and automobile, technology lends to the fragmentation of people's lives and also helps stitch those fragments back together again. Most online veterans tend to agree that the challenge is to merge the connections made in cyberspace with real lives.

"We're not going to bridge anything simply by connecting," warns Jones. "We can build all the bridges we want, but if we don't cross them and mill about, we won't make any kind of connections that count." ***—With reporting by Hannah Bloch, John F. Dickerson and Jeffery C. Rubin/New York and Julie Grace/Chicago***

A HANGOUT FOR EVERY OCCASION

There are a hundred thousand haunts in cyberspace—each with its own crowd, own interests and own point of view. Here is a sampling of some in the U.S.:

Honest Talk The conversation on ECHO is more thoughtful and civilized than on a lot of other services, in part because almost 40% of the members of this New York City–based community are women. Try the Culture and Psych conferences.

Singles … or doubles, or *ménages à trois* for that matter: the hottest pick-up joints are the chat rooms of America Online's People Connection.

Gravitas The liberal-intellectual crowd gathers nightly on the WELL, the San Francisco area–based Whole Earth 'Lectronic Link. The media and radio conferences attract the glitterati, and participants in the philosophy conference know not only the spelling of Kierkegaard's name but the views he propounded.

Deadheads Devoted followers of The Grateful Dead know the place to worship their heroes is the WELL's Dead conference.

Twentysomething Gen-Xers hang at Manhattan's MindVox and contemplate 50 more years of living under the shadow of Yuppies.

A Good Laugh The exchange of jokes is unfiltered and thus occasionally unfunny in the *rec.humor* newsgroup. A finer repertoire, or so it is said, is in *alt.humor.best-of-usenet,* which is monitored.

Doubting Thomases True believers in parapsychology and other pseudosciences are in for a tough time with the crowd that frequents the *alt.paranet.skeptic, bit.listserv.skeptic* and *sci.skeptic* newsgroups. But keepers of the faith show up to defend their theories, making for heated exchanges.

Cancer Patients Mutual support from fellow sufferers, their doctors and families comes in *alt.support.cancer.*

Wonks Political junkies duke it out on the Capital Connection, while current-events generalists visit TIME Online—both on AOL. CompuServe's Rush Limbaugh message boards regularly draw a crowd. Specialized areas exist on the Internet for every imaginable viewpoint, from *alt.society.anarchy* to *alt.politics.clinton.*

Furry Tales *rec.pet.cats* is for serious cat lovers. But the occasional mischief-maker shows up and posts hair-raising descriptions of feline abuse designed to shock the regular denizens.

A New Divide Between Haves and Have-Nots?

Access to the information highway may determine the basic ability to function in a democratic culture

By SUNEEL RATAN / Washington

IF THERE WAS ANY LINGERING doubt that the computer has become ensconced as a member of the American family, it was dispelled at the turn of the year by some startling statistics. For the first time ever, consumers in 1994 bought $8 billion worth of PCs—just a smidgen away from the $8.3 billion they spent on TVs. The sales record in terms of dollars is bound to fall to the computer soon, though the TV's cheaper price guarantees its dominion in numbers for a while yet.

In America's poorer areas, however—places like Washington's Anacostia neighborhood, the hollows of Appalachia or Miami's Liberty City—families with IBM Activas, NEC CD-ROM drives, modems, Internet connections and all the other paraphernalia so beloved by computer users are few and far between. Therein lies one of the most troubling aspects of the emerging information age. In an era in which success is increasingly identified with the ability to use computers and gain access to cyberspace, will the new technology only widen the gap between rich and poor, educated and uneducated, blacks, whites and Hispanics? As U.S. Commerce Secretary Ronald Brown puts it, "How do you create an environment so that once we've built this information infrastructure, you do not create a society of haves and have-nots?"

The stakes are high. Access to the information highway may prove to be less a question of privilege or position than one of the basic ability to function in a democratic society. It may determine how well people are educated, the kind of job they eventually get, how they are retrained if they lose their job, how much access they have to their government and how they will learn about the critical issues affecting them and the country. No less an expert than Mitch Kapor, co-founder of Lotus Development Corp. and now president of the Electronic Frontier Foundation, feels that those who do not have access "will be highly correlated with the general have-nots. Early in the next century the network will become the major conduit through which we conduct our lives. Any disenfranchisement will be very severe."

The fact is that access to the new technology generally breaks down along traditional class lines. Wealthy and upper-middle-class families form the bulk of the 30% of American households that own computers. Similarly, wealthier school districts naturally tend to have equipment that is unavailable to poorer ones, and schools in the more affluent suburbs have twice as many computers per student as their less-well-funded urban counterparts. All this disparity comes to a head in this statistic: a working person who is able to use a computer earns 15% more than someone in a similar job who cannot.

The debate over how to handle the problem pits the freewheeling techno-cowboys of the computer and telecommunications industries against traditional advocates for the poor. The computer and telecommunications industries proclaim a paramount faith in market forces, at least partly because they fear eventual government regulation of access to the infobahn. As they see it, the forces of competition and the marketplace will drive the prices of equipment and online services downward and make both increasingly available to the less affluent.

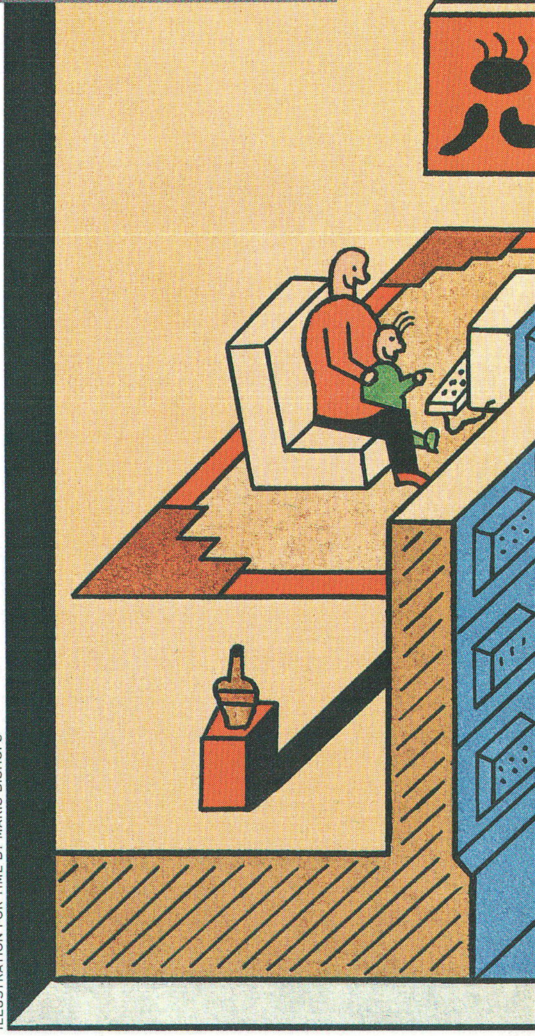


ILLUSTRATION FOR TIME BY MARIS BISHOFS

Those who can use a computer earn 15% more than others

There is considerable evidence to support that view. The newest computer models have capabilities far beyond those of their predecessors and are priced lower; presumably, they will continue getting cheaper. Moreover, ever upgrading "heatseekers," who are constantly searching for the latest equipment, are bound to create a vigorous secondhand market. Machines that might otherwise be wasted are instead being sold into the used-computer market, where they can be snapped up by the less advantaged in the same way that poorer people buy used cars instead of new ones.

The problem, as advocates for the poor point out, is that all of today's information roads charge tolls, sometimes hefty ones, that effectively bar even many of those who manage to put together the price of a secondhand computer. The situation is further complicated by the tendency of telecommunications companies to place the new information networks in more affluent communities, bypassing, at least for the moment, poorer rural and inner-city areas. Representative Ed Markey, a Massachusetts Democrat, calls this separating-out process "information apartheid." A coalition of consumer, poverty and religious groups last May petitioned the U.S. Federal Communications Commission—which has not yet acted on the matter—to ban what they labeled "electronic redlining," a term derived from the banking practice of refusing loans to people and businesses in areas considered ghettos. "We're talking about something more than plain old TV," says Jeff Chester of the Center for Media Education, a liberal advocacy group. "We're talking about access to the central nervous system of our democracy."

The ignorant are stung by "apartheid" and "red-lining"

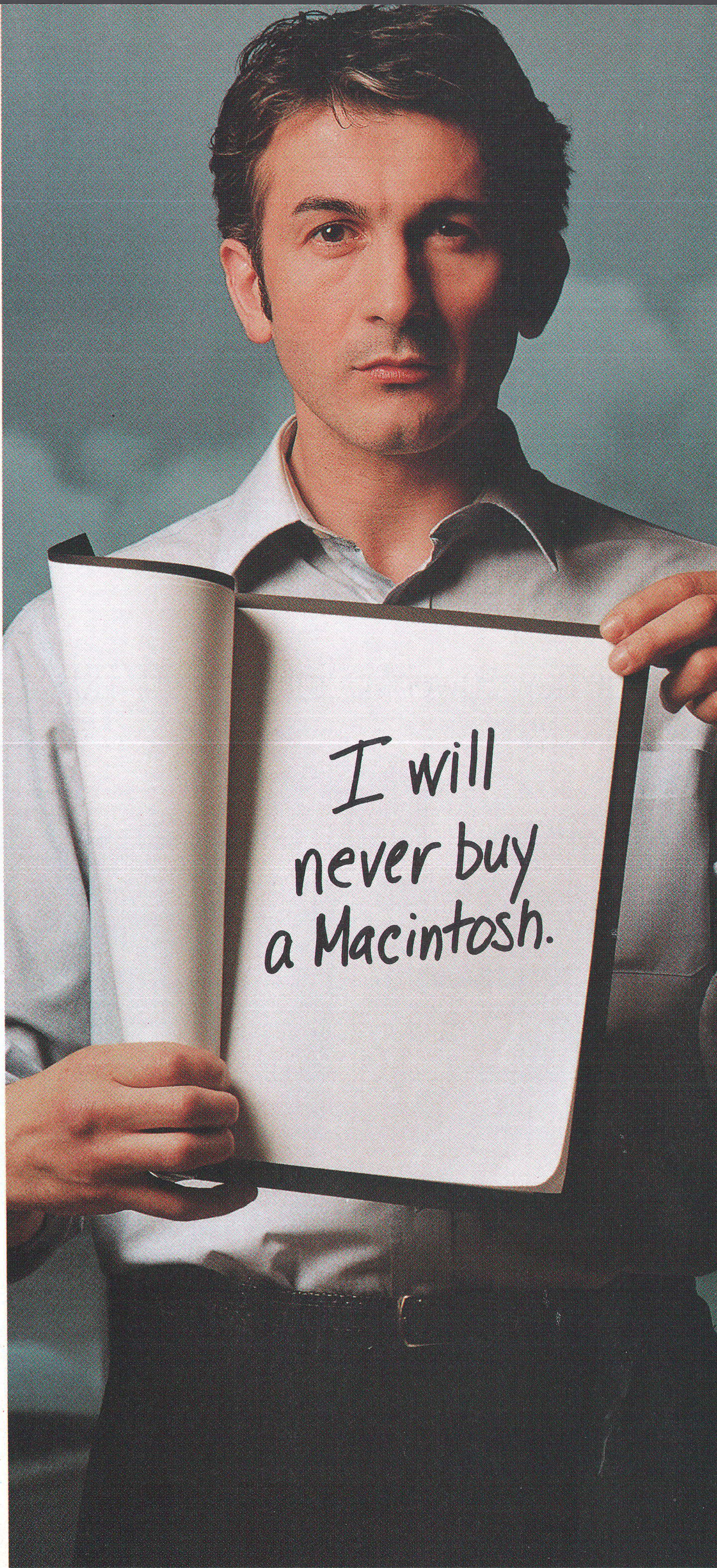
Ensuring that broadband networks are rolled out to America's inner cities and rural areas at the same time as they are to affluent suburbs would by no means solve all the problems. There is the question of how the undereducated would be able to learn to operate computers—even if they could afford to buy them. Nicholas Negroponte, director of the Massachusetts Institute of Technology Media Laboratory, argues that the growing pervasiveness of computers in schools and homes, and the increasing ease of computer use, will dispel techno-illiteracy. Negroponte may be correct, but the transition to widespread computer literacy could easily take 20 or 30 years.

Another part of the debate, now being waged in Washington, is how to expand the 60-year-old concept of universal telephone service to emerging high-speed information services. Part of the problem is that at least 7 million American homes, most of them poor, do not even have the phones that could provide basic access. It is difficult to see people who lack such a necessity of modern American life going out and buying a computer. In January, House Speaker Newt Gingrich raised the idea of giving poor people tax credits to buy laptop computers, but in an era in which middle- and upper-middle-class Americans seem intent on cutting benefits for the poor, meaningful Net-access subsidies seem unlikely.

Yet the information industry is moving so fast that government officials are reluctant to intervene in any way that might slow its dynamism. In a search for creative ways to lessen the technology gap, advocates of wider access are focusing on plans to put computers and Net connections into libraries, post offices and other public places around the country to serve those who do not have home computers.

MANY OF THE EARLY APproaches are local and small scale, but they may point the way to the future. New York City's United Community Organization, an umbrella group of neighborhood settlement houses, in February began installing in its project buildings 200 PCs with ISDN (Integrated Services Digital Network) connections to the Internet. Financed by $1.4 million in U.S. government grants and private donations, the machines help the settlement-house staffs coordinate their work and give neighborhood residents the opportunity to cruise the highway, have access to government databases, exchange E-mail and otherwise sample cyberspace's many wonders. The city of Santa Monica, California, has started a public electronic network, installing 15 public-access terminals in such places as banks, community centers and even grocery stores. Anyone who wants to—including the homeless—can get online information about city services, make E-mail connections to city officials and local members of Congress and join discussion groups about contentious local issues like rent control and homelessness.

Mark Cooper, research director of the Consumer Federation of America, argues that there are no panaceas for national concerns about the gap between the information haves and have-nots. Nor, he believes, will eventual computer literacy and Net access do much to end the blight of poverty, illegitimacy, rural isolation and urban decay. "There's always going to be an unequal distribution of income," Cooper says. That's probably true, but at the very least, the new technology should unleash all its considerable energies toward the goal of preventing those problems from getting any worse. ■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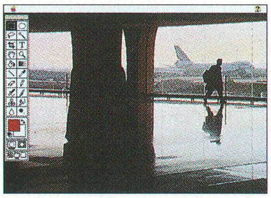

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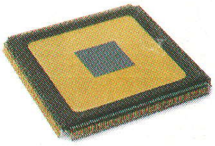

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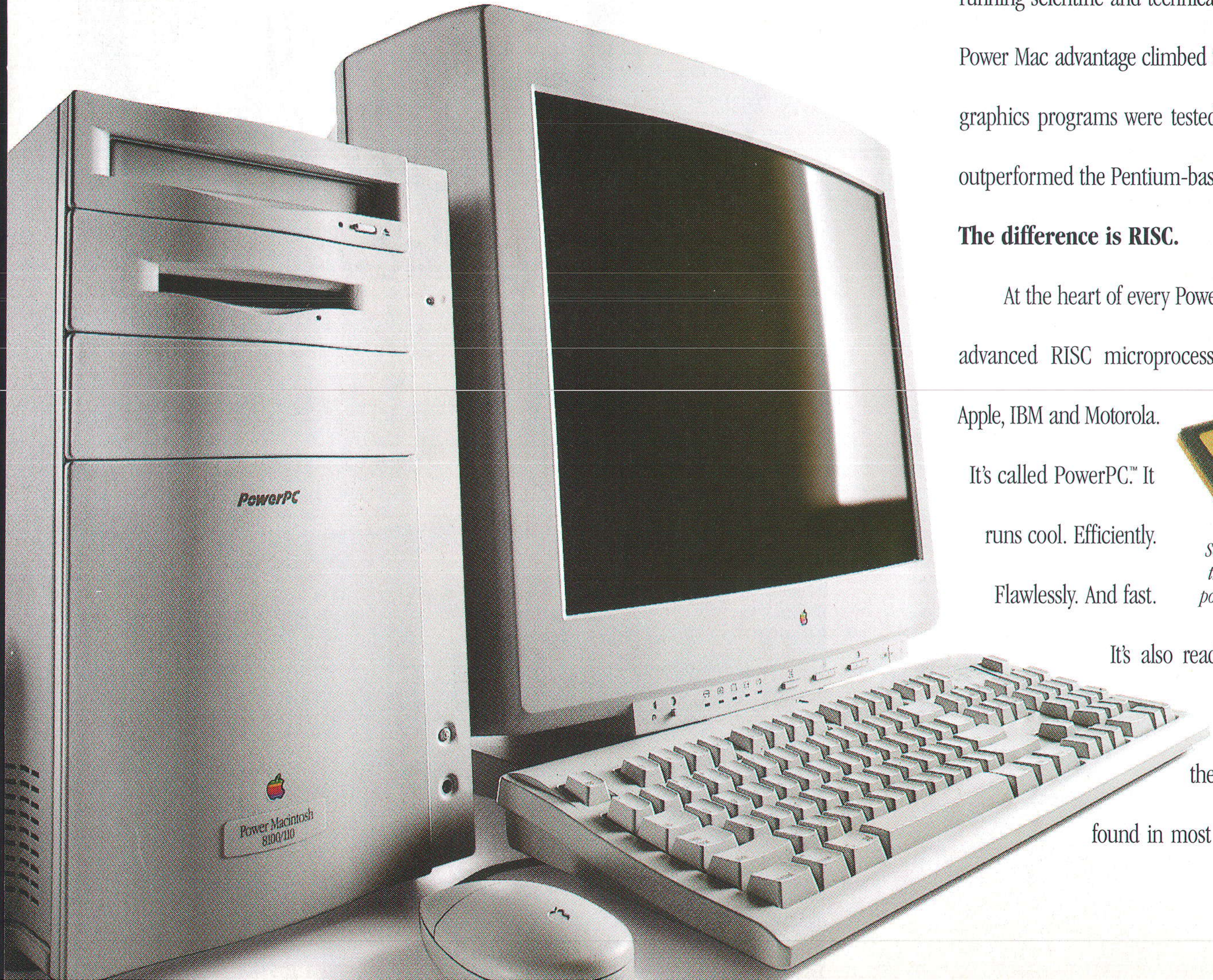

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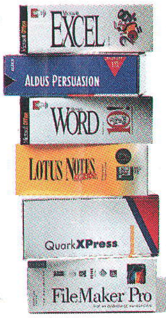

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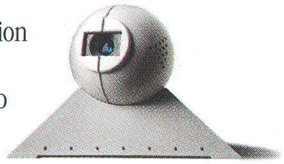


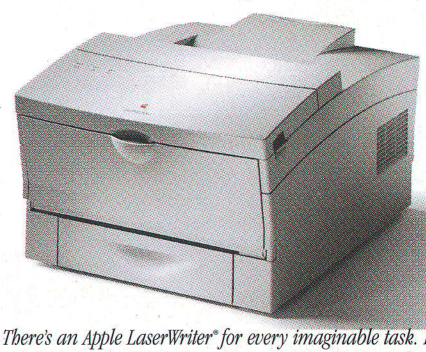
Developers are creating thousands of powerful new applications, like videoconferencing, specifically for Power Macintosh.

It's not what the computer can do. It's what you can do.

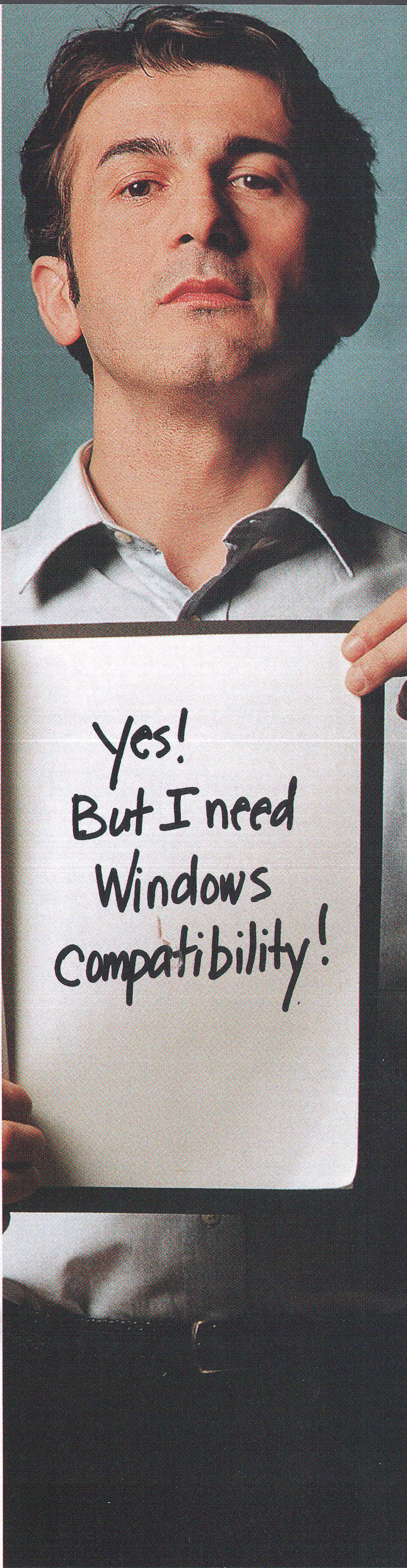
With all this innovation, there's one thing that hasn't changed. A Macintosh is still the easiest personal computer in the world to use.

While other PC makers are talking about "plug and play," for example, we're simply doing it. And while other companies develop new operating systems or shells on top of old ones to make computing more intuitive, every Power Mac ships with Mac™OS, the operating system that helps people be 44% more productive than if they use Windows.**

What could be more powerful than that?

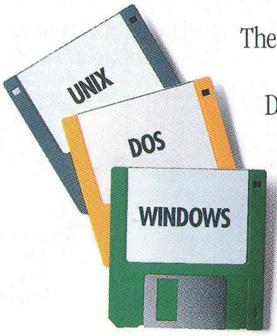


There's an Apple LaserWriter® for every imaginable task. Like this high-speed, 600 dpi LaserWriter 16/600 PS. It's perfect for high-demand, high-volume workgroup environments.


Yes!
But I need
Windows
Compatibility!

Introducing the world's most compatib

The new Power Macintosh 6100/66.

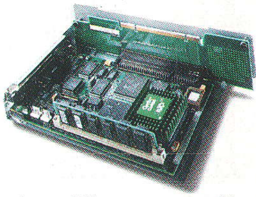


The new Power Macintosh 6100/66 DOS Compatible isn't just a personal computer—it's two computers in one box.

It runs Windows applications. It runs DOS applications. It runs Macintosh applications. It runs them all at the same time, and gives you the ability to cut and paste between them.

No other computer runs so many different kinds of software. Gives you so much flexibility. Or delivers it all with so much ease.

Because no other computer combines both a 486 DX2/66 microprocessor and a PowerPC processor in one completely integrated system.



What could be more compatible with Windows than a true 486 DX2/66 chip? That's exactly what you'll find inside the Power Mac 6100/66 DOS Compatible.

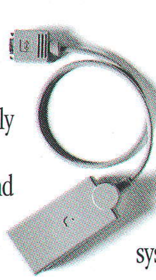
Windows compatibility is just the start.

Like all Power Macintosh systems, the Power Macintosh 6100/66 reads, writes and formats DOS, Windows and OS/2 disks. Like every Power Mac, it also lets you open, edit and save Windows and DOS files—even if you don't

le PC.

have the PC program that created them.

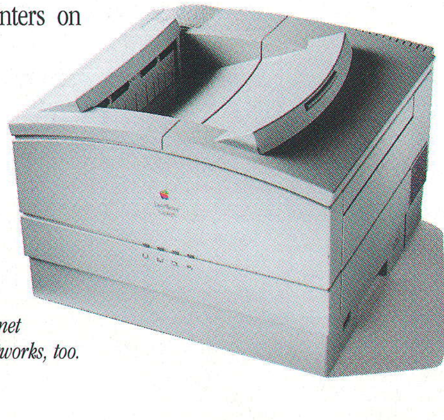
How can you do that? With a simple double-click. Because if you don't have the originating PC program, your Power Mac simply asks what application you want to use and converts the file for you — automatically.



It's compatible with your network.

Any Power Mac can plug into your existing Ethernet or AppleTalk®-based network. But because the Power Macintosh 6100/66 DOS Compatible puts a real 486 DX2/66 chip in your Power Mac, it can plug directly into your existing Novell NetWare TCP/IP or IPX-based network. Meaning it supports all your DOS and Windows network applications, too. Not to mention all your people who use DOS and Windows networks.

You can even connect it to both a Novell and an AppleTalk network simultaneously. So you can print to printers on either network. Share modems on either network. Pull files from either network. And more.



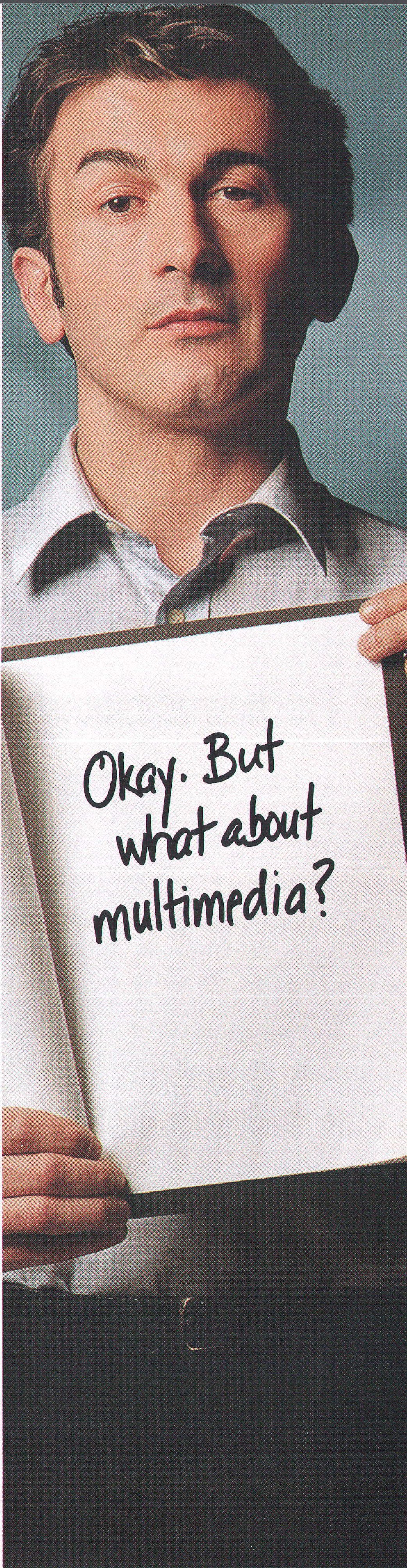
The LaserWriter Select® 360 isn't just compatible with Power Macintosh. It's compatible with your Ethernet DOS or Windows-based networks, too.

It's compatible with the world.

Because the Power Macintosh 6100/66 DOS Compatible includes System 7.5 (the latest version of the operating system that made the Macintosh famous), it also includes a little productivity-enhancing surprise called Universal Mailbox.

How does Universal Mailbox boost productivity? It simplifies your connection to the world at large. It collects voice mail and e-mail and faxes — all your communications — in one mailbox icon on your Mac desktop. All automatically. So whether you're receiving faxes from Frankfurt, sending voice mail to Vienna or shipping vital information through the intricacies of the Internet, you can do it all from your Universal Mailbox.

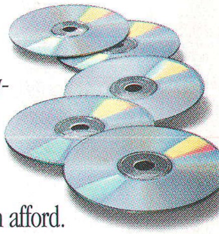
Which, when you think of it, makes Power Macintosh compatible with a very basic human need: the need to be heard. And understood.


Okay. But what about multimedia?

Introducing the ultimate multimedia

The new Macintosh Performa 5200.

The new Macintosh Performa® 5200 is an entirely new breed of PC. Or is it? You see, it can also be a TV. And a stereo. An answering machine. And a fax machine. You can use it to make movies. Or music. It can connect you to the Internet. To the world.

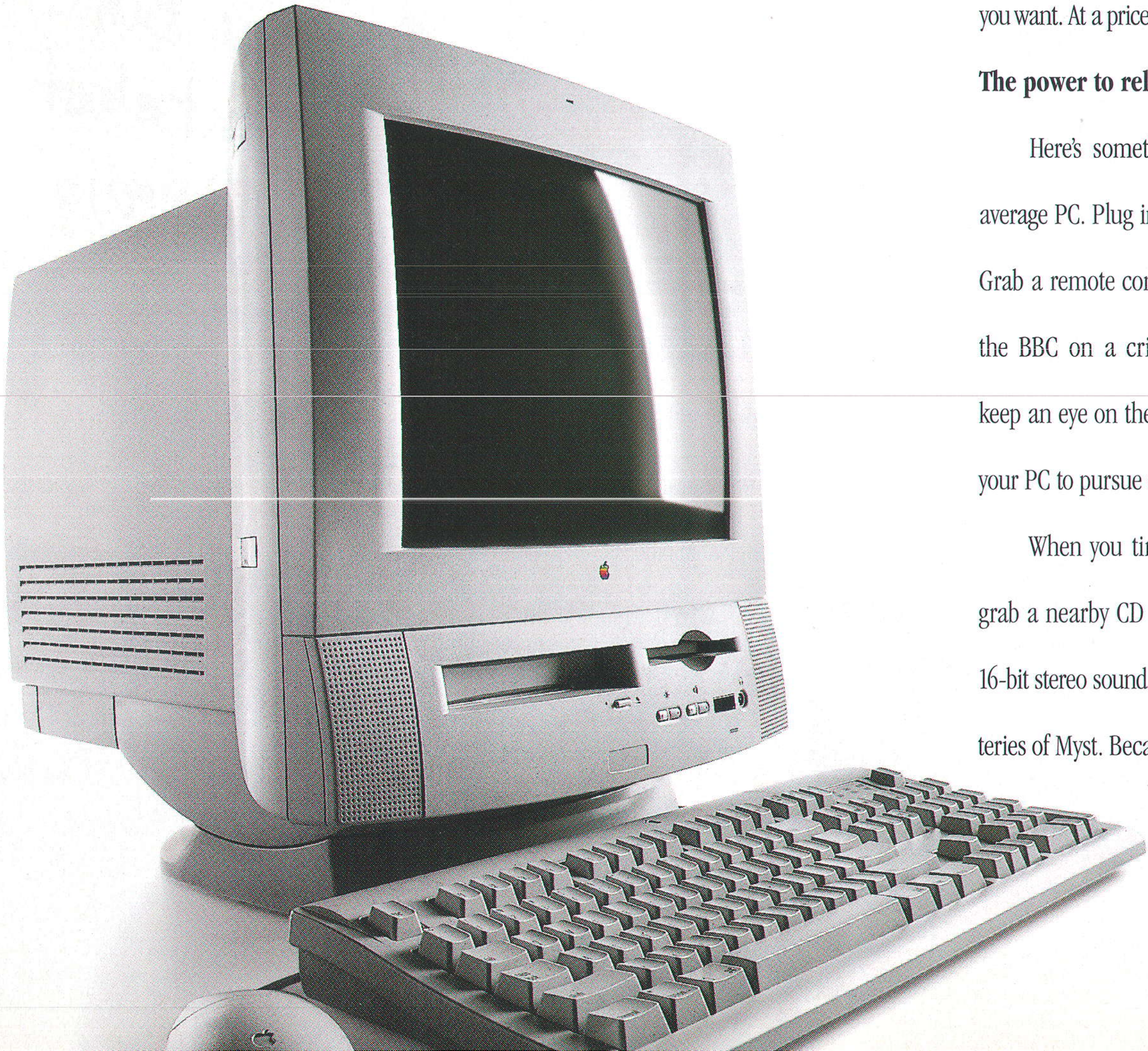


In short, it can be anything you want. Anytime you want. At a price you can afford.

The power to relax.

Here's something you cannot do at your average PC. Plug in a cable-ready TV tuner card. Grab a remote control. And sit down and watch the BBC on a crisp, 15-inch color display. Or keep an eye on the football match while you use your PC to pursue other equally critical tasks.

When you tire of watching television, just grab a nearby CD and you can listen to Liszt in 16-bit stereo sound. Or you can dive into the mysteries of Myst. Because two stereo speakers and a quadruple-speed CD-ROM drive that's compatible

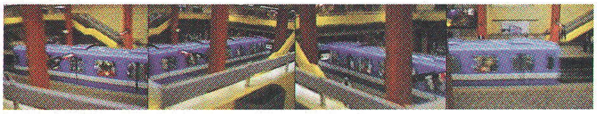


PC.

with both audio and multimedia CDs are built in.

The power to create.

But you don't have to just sit there. You can pick up any standard video camera, plug it into the back of your Mac and create your own movies. Or pick up an Apple® QuickTake™ camera and build your own photomontage. Or pick up a guitar and record and mix your own music. The possibilities are endless with three standard slots, plus stereo in and stereo out. All you have to do is add the cards and options you want. To make the Performa 5200 exactly the PC you want.



It's easy to edit videos and mix music with the Avid VideoShop software you get with the TV Tuner card. When you're done, just record the results back to tape.

The power to communicate.

Macintosh computers have always helped people share ideas and information in new, compelling ways, but never before have so many possibilities been packed into one system.

And here's yet another way to share. Add a modem to your Macintosh Performa 5200 and it can take telephone messages for you, send faxes for you, receive faxes for you and more. You can connect to popular online services. To the Internet, too. That's right, with a simple modem and a Mac, you can connect with the world.

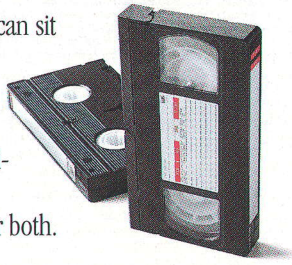
With the Color StyleWriter® 2400 ink-jet printer from Apple, you can make multimedia look its best on paper, too.

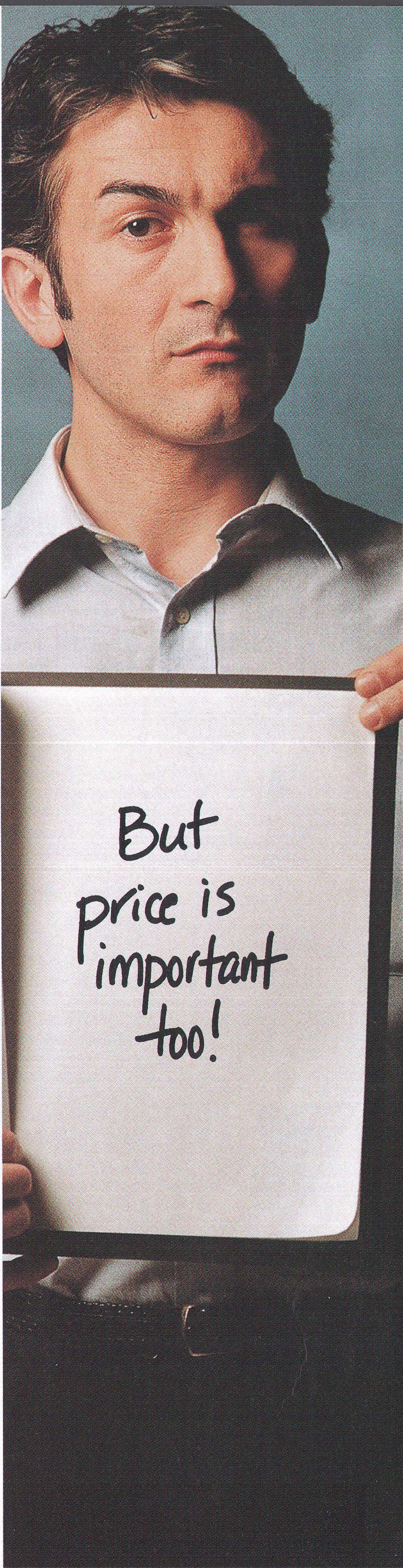
The power of a technology named RISC.

The Macintosh Performa 5200 is based on the RISC microprocessor known as PowerPC. Which means it runs all your software fast. Faster than Pentium-based PCs.* And two to eight times faster than any 030- or 040-based Macintosh ever built.

But it's not what the computer can do. It's what you can do.

That's why we preinstall so much useful software. And why we built so many multimedia capabilities into one PC. And why, like every Power Macintosh, the Performa 5200 runs the Mac OS. So you can sit down at your PC. And get down to business. Or pleasure. Or both.





Introducing the best values you can find in personal computing.

No matter what your budget is, there's a Macintosh for you. Beginning with the powerful, flexible and very affordable systems you see below. For more information, including exact configurations and pricing, visit your nearest authorized Apple reseller today.

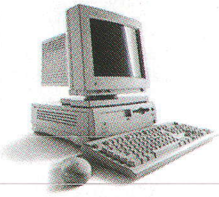
Power Macintosh 8100/100 and Power Macintosh 8100/110.
Processor: PowerPC 601 RISC with integrated math coprocessor; 256K level-2 cache.
Speed: 100 or 110 megahertz.
Memory: 8MB or 16MB of RAM, expandable to 264MB.
Expansion: Three NuBus™ slots. Supports seven SCSI devices.
Networking: Built-in Ethernet and LocalTalk®.
Display: Built-in support for 16.7 million colours.

Power Macintosh 7100/80.
Processor: PowerPC 601 RISC with integrated math coprocessor; 256K level-2 cache.
Speed: 80 megahertz.
Memory: 8MB or 16MB of RAM, expandable to 136MB.
Expansion: Three NuBus slots. Supports seven SCSI devices.
Networking: Built-in Ethernet and LocalTalk.
Display: Built-in support for 16.7 million colours.

Power Macintosh 6100/66 DOS Compatible.
Processors:
- 66-megahertz PowerPC 601 RISC with integrated math coprocessor; 256K level-2 cache.
- 66-megahertz 486 DX2.

Memory: 16MB of RAM, expandable to 72MB.
Expansion: Slot for NuBus expansion card. Supports seven SCSI devices.
Networking: Built-in Ethernet and LocalTalk.
Display: Built-in support for 32,768 colours.

Macintosh Performa 5200.
Ergonomic all-in-one design with built-in 15 " display, speakers, infrared receiver.
Processor: PowerPC 603 RISC and 256K level-2 cache.
Speed: 75 megahertz.
Memory: 8MB of RAM, expandable to 64MB.
One LC PDS slot supporting numerous expansion cards.
One communications slot supporting Ethernet or modem card.
One video-in slot supporting video in and TV card.
Supports seven SCSI devices, stereo sound-in, stereo sound-out.



Macintosh Performa 630.
Processor: 68LC040.
Speed: 66/33 megahertz.
Memory: 5MB or 8MB of RAM, expandable to 36MB.
One LC PDS slot supporting numerous expansion cards.
One communications slot supporting Ethernet or modem card.
One video-in slot supporting video in and TV card.
Supports seven SCSI devices, stereo sound-in, stereo sound-out.

Macintosh PowerBook® 500 Series.
Processor: 68LC040.
Speed: 50/25 or 66/33 megahertz.
Memory: 4MB of RAM, expandable to 36MB.
Expansion: Three slots - one for a processor direct card, one for an internal modem, one for RAM; PowerBook PCMCIA Expansion Module (optional).

Apple®

*Ask for the 1995 Ingram study comparing Power Mac computers to Pentium-processor-based computers running Windows. **Productivity comparison: Macintosh versus Windows study by Arthur D. Little, Inc., January 1994. © 1995 Apple Computer, Inc. All rights reserved. Apple, the Apple logo, AppleTalk, LaserWriter, LaserWriter Select, LocalTalk, Macintosh, Performa, PowerBook and StyleWriter are registered trademarks of Apple Computer, Inc. Mac, Power Mac, Power Macintosh and QuickTake are trademarks of Apple Computer, Inc. PowerPC is a trademark of International Business Machines Corporation, used under license therefrom. Adobe and Adobe Persuasion are trademarks of Adobe Systems Incorporated or its subsidiaries and are registered in certain jurisdictions. Lotus Notes is a registered trademark of Lotus Development Corporation. NuBus is a trademark of Texas Instruments. UNIX® is a registered trademark of Novell, Inc., in the United States and other countries, licensed exclusively through X/Open Company, Ltd. Lotus Notes photo used with permission of Lotus Development Corporation. Photos of Microsoft products reprinted with permission from Microsoft Corporation.

For more information on Power Macintosh, send this coupon to:

Mike Taylor - The Apple Information Centre - Freepost - London SW15 2YY - UK - Telephone (UK only): 0800 127753.

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Telecommunications.

Cyberspace. The Internet.

Ironically, you can keep up

with them by reading words

printed on actual paper.

Understanding comes with TIME.

TIME's second *Global Agenda* report. An informed look at the State of Technology.
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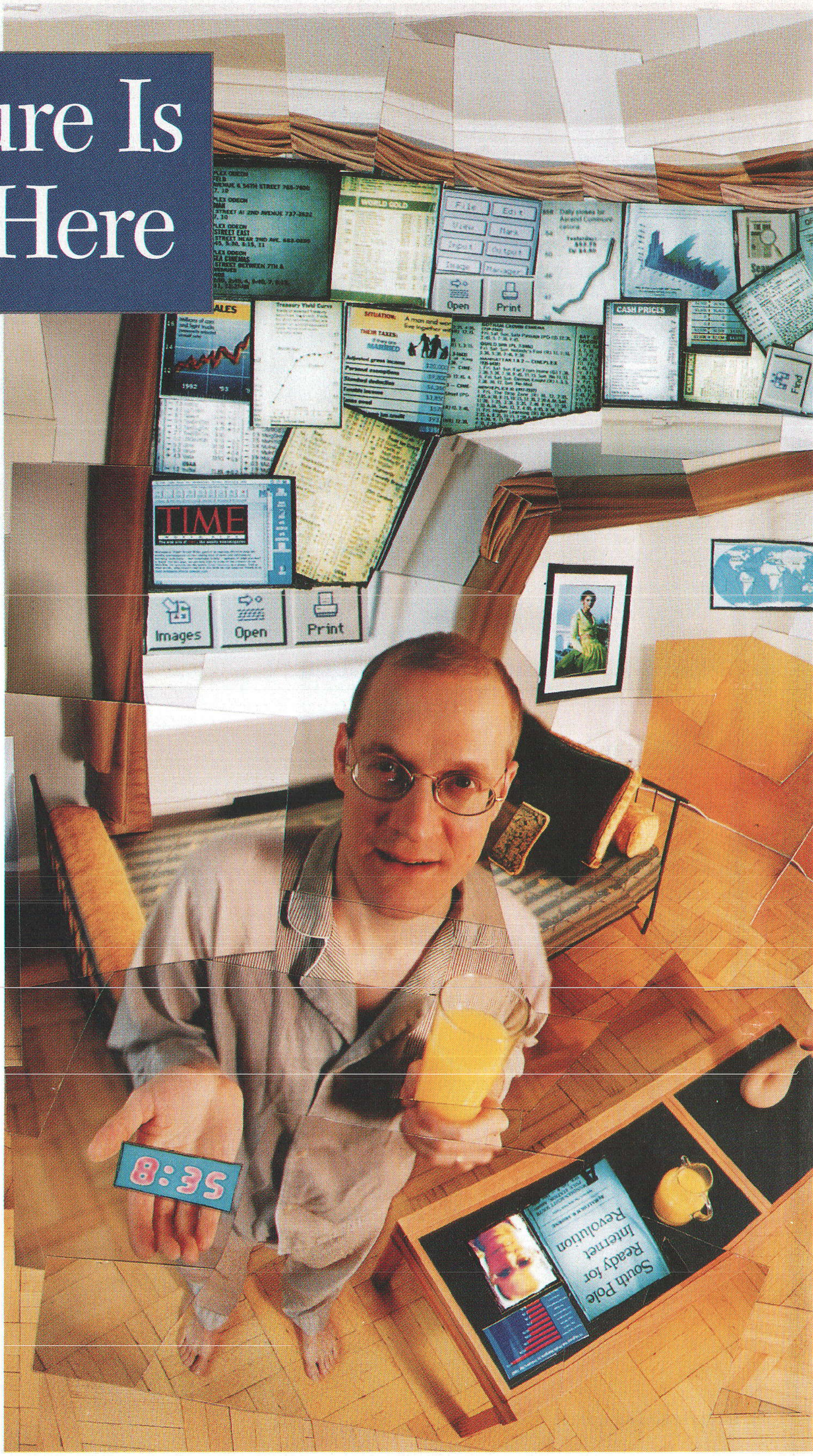
GLOBAL
AGENDA

The Future Is Already Here

By BARRETT SEAMAN



IT IS SIMPLE BUT INGENIOUS, easily accessible—and it gives people what they want without fuss or argument. It is, in short, one of the great conveniences of modern technology: the ATM, or automated-teller machine.

Only a few years ago, getting your hands on real money meant waiting in line at the bank, or knowing the corner shopkeeper well enough to cash a personal check. The ATM changed all that, using a fusion of computer chips, telepad, phone line and dispensing mechanism to transform the way people access their money. Armed with only a plastic card and a functioning index finger, a customer can now obtain cash as easily in Tierra del Fuego as in downtown Brussels.

Yet the ATM's great convenience and relatively humble workings should not obscure the fact that it is in the vanguard of the information age, no less than the Internet, interactive TV or video teleconferencing. By applying technology to people's everyday needs, it epitomizes what Yale University computer scientist David Gelertner calls "the true potential of the information superhighway: making everyday life for most people somewhat easier and less irritating."

To that end, the new age of technology is already well launched, fueled by a long stream of techno-driven goods and services that is flooding the consumer marketplace to change the ways people live and work. So advanced is this transformation that even some of the most recent innovations are already taken for granted.

The heart of the cyberrevolution remains, of course, the personal computer. Cheaper, faster, more versatile and easier-to-use PCs are infiltrating America's social fabric. Software like Mosaic and Netscape

PHOTO COLLAGE FOR TIME BY JEREMY WOLFF

has made navigating the Internet a lot less daunting for average citizens, who are rushing to buy modems and sign up for online services.

The modern, well-wired U.S. home already offers young and old a head-spinning array of computer-borne activities. Children use CD-ROMS to play games and hear music. Teenagers flock to online services not only to "chat" but also to reach primary schoolwork sources, such as images of original works of art, documents prepared by experts, even possible exchanges of E-mail with the experts themselves. Adults have access to instant stock-market quotes, to online versions of magazines and to a host of "clubs," where people gather to discuss subjects ranging from astronomy to genealogy to bicycling.

An increasing stream of **techno**-driven products has already begun to change the way **people** live and work

Using online programs and the Internet's increasingly crowded World Wide Web, one can find not just information about products and services but help in bringing the transactions to a conclusion as well. Real estate agents are discovering online as an efficient way to sell properties. The Homes and Land Publishing Corp.'s Website lists homes across the U.S.—by state, then by city. The Austin Real Estate Connection in Texas gives information on the full range of home-buying services, from photographs of the houses to the names of builders and mortgage lenders, lawyers and title companies. Using a search program, prospective buyers can enter preferences, such as price range, style, school district and number of bedrooms, and thus narrow the field to homes that meet those criteria.

In some instances, whole U.S. communities—even states—are building multipurpose computer networks. For the past 18 months, a partnership between the town of Blacksburg, Virginia, Bell Atlantic and Virginia Tech University has operated a communal network called the Blacksburg Electronic Village. By the end of 1994, the project had hooked up a majority of the town's businesses and 36,000 citizens, including 24,000 students at Virginia Tech, whose campus is situated in town. All these people reach the Internet through a local network that ties Blacksburgians to the town hall, hospitals, stores, restaurants and one another. In time, participating merchants hope to do business using Digicash Corp.'s "E-cash," a form of electronic money.

Computer-connected communities, in various stages of development, are operating in dozens of cities in the U.S. and Canada. The entire state of North Carolina has built its own information highway based on a fiber-optic system that links most of the state's departments and services, its public universities and even parts of the penal system. In Mecklenburg County, for example, a video link permits prisoners to "appear" before judges without actually making the trek to the county courthouse.

CONVENIENCE REMAINS AT THE core of any technological application, which is a big reason why television, as a conduit of news and entertainment, still commands impressive loyalty. Operating instructions are crystal clear: turn on the set, select a channel and watch. Where TV is vulnerable, however, is in the area of choice. Traditional U.S. network television delivers a packaged product: news at 6:30, sitcom at 8, movie at 9, a pattern that, VCRs notwithstanding, often does not match individual viewers' needs. Communications giants, including Time Warner, Viacom and Comcast, are currently conducting trials of interactive-TV systems that attempt to merge convenience and choice. In Time Warner's Orlando, Florida, test market, for example, participating families are able to choose from a video menu of movies, shopping catalogs, network programming and news—switching from one to another whenever they choose.

The new services offer more than video entertainment. Telephone giant U S West (a partner in the Orlando experiment as well as others) contributes an interactive elaboration of its printed yellow pages. With the click of a remote, viewers can survey the local restaurant scene, read reviews, peruse the menus and even reserve a table for four at 8. Or they can check local movie theaters—not only for what's playing and when but for what rating a film carries, what the critics are saying and previews of films. Tickets can be bought in advance through a credit-card debit system. "This is not couch-potato stuff," says Sol Trujillo, president of U S West Marketing Resources. "It gets the people *out*."

Indeed, a driving force behind most research and development in the communications field today is mobility. Smaller, lighter, multifunctional devices—and programs to run them—are pouring onto the market, with names like Envoy, Magic Link, Marco, Simon and Zoomer. Most of these devices combine the two basic technologies of the information age: computing and telephony—a union that promises more than the sum of its parts.

The idea is to stuff as much information and as many communications tools as possible into a small package—called a personal digital assistant, or PDA—that will perform dozens of tasks for the user. More advanced versions, weighing less than 1 kg, can operate off a regular phone line or cellular connection and send and receive faxes, voice mail or E-mail. They can be used to keep appointment schedules, expense ledgers, addresses and phone numbers, as well as large digitized documents.

Some of these devices include (or soon will) so-called intelligent agents: programs that sort your E-mail, find you a convenient flight and book a seat or remind you of appointments and anniversaries. Electronic secretarial services are already in use in sophisticated paging systems on the market today. Call someone—let's call him Fred—who uses Wildfire, and you will be greeted by a "personal receptionist" who asks you to "tell me your name, and I will try to find Fred for you." Half a minute may go by, but if Fred wants to talk to you—even from his raft in the Colorado River—he will get the message on his cell phone and come on the line. If Fred is too busy negotiating the rapids to talk, you can always leave him a voice-mail message.

The reach of phone systems continues to extend across the planet, as cellular transfer stations are built and communications satellites are launched. If Motorola's ambitious Iridium satellite project is ever completed, prospectively in 1998, virtually no place on earth will be out of range. Satellites are also making possible commercial use of the Pentagon-developed global positioning system, which was employed by soldiers using handheld monitors during the Gulf War to pinpoint their location in the desert. Private-boat owners have been using GPS to fix their position at sea for the past decade.

Now, GPS is available in U.S. autos. Oldsmobile buyers can opt for GPS receivers, with accompanying digitized road maps, built right into their dashboards. A motorist lost somewhere in California can tap into GPS and get an instant position on the digitized map, accurate to the length of a minivan. At its current $1,995 price, GPS is still an expensive option, but rental-car companies are very interested. As prices eventually come down, these locators could become common features in cars.

One of the hottest testing grounds for consumer-related technology is the supermarket. Across North America, food stores are erupting with radio and infrared data bursts that track pricing changes, inventory and customer buying patterns. Battery-powered shelf labels that receive instant price changes via radio transmitter are currently used in 25 Edwards Super Food Stores in Connecticut; more than 40 European stores employ a solar-powered version that receives pricing data via infrared. Several large food retail operators are exploring the use of "smart cards" and interactive kiosks to provide shoppers with information and keep track of the buying habits of their regular customers, using the information to adjust inventories and to price and promote products better.

Today's hospitals are using communications technology to send digitized images of everything from broken bones to brains from one medical facility to the next. Even mede-

Flat-panel screens bearing a multitude of images will eventually decorate the American home.

vac units at remote accident locations can send images and data back to base hospitals so that emergency-room teams know exactly what they are dealing with when the patient arrives. Although teleradiology has been around for a decade or so, only now is it moving into the mainstream of medical care, thanks to lower-cost computers, significantly improved clarity of video images and improvements in networking and in telecommunications. Many surgeons routinely use sophisticated computer-driven probes and TV imagery to help them in their diagnoses and operations.

THE SMART SHOPPER
Would you like to purchase this item now?
YES
NO

Clockwise from above: Buying a shirt by touching interactive screen; using choice-rich remote to watch interactive show; viewing a pig's liver in virtual reality before operation; paying for coffee with an electronic wallet

CLOCKWISE FROM TOP RIGHT: AT&T, MARK RICHARDS—DOT FOR TIME, MEDICAL MEDIA SYSTEMS, MICROSOFT

All this and more already exists. With a little tweak of the technology here or an imaginative pairing with other technologies there, computer-based devices are likely to affect our lives even more frequently in the months—as well as in the years—ahead.

Digital display screens visible above highways, warning of icy bridges ahead and detours, will become even more ubiquitous and varied. So will the long-awaited telescreen for seeing and being seen by those you talk with on the telephone. Carl Ledbetter, president of AT&T's Consumer Products division, predicts that "in a decade, every phone will have a screen on it." At Xerox's Palo Alto Research Center in California, where the PC, on-screen icons and the laser printer originated, Mark Weiser, manager of the computer science laboratory, envisions a world in which flat-panel screens bearing a multitude of images will be household regulars. They will range from tiny ones, costing perhaps $5 each and plastered everywhere, to wall-size ones for viewing video. The smaller ones, says Weiser, are "where you'll plan your grocery list or do your homework. They'll be the equivalent of Post-it notes on the refrigerator or the crumpled-up notepaper in your pocket."

In Weiser's world, people will wake up to a tiny bedside screen that gives the time and the weather forecast and even displays news headlines or sports scores. Pocket-size screens would also serve as remote controls for larger screens in the bedroom or living room, where family members will use them variously to watch TV, read the newspaper (which will be customized for each member's personal interests) or draw up the family grocery list.

To get themselves through the day, people will carry pocket-size Personal Assistants, called smart badges or smart cards, encoded with basic information that uniquely identifies them. Simple versions of such devices would allow their carriers to walk through security checkpoints—a concept already being tested in a section of the Paris Métro, where commuters need never remove the card from their pockets.

In future supermarkets, consumers will shop without having to pay cash or sign credit-card receipts. An infrared or microwave "interrogator" could register each consumer as soon as he or she enters a store and be ready with account information when the time comes to pay. Supermarket futurist Gary Lind, a partner at Arnold Ward Studios/Lind Design in Hempstead, New York, envisions "intelligent carts" that will use optical lasers to scan bar codes automatically as items are moved in or out of a shopping cart, thus enabling customers to keep a running tab. These carts might even be programmed to organize the customer's shopping expedition through the store, by scanning a handwritten list and sorting out the fastest route through the aisles.

The process of Home Shopping, now a three-part, cable-TV, dedicated phone number and credit-card transaction, is poised to move to a higher level of interactivity. Next: interactive-TV programs and in-store kiosks known as "electronic mirrors" with holographic images that enable buyers to see what clothes look like on them without trying anything on. Computer catalogs of homes will include virtual-reality "tours" of each room in a house.

Not all of this will take commercial root. The marketplace, for example, will weed out even technically feasible devices if they prove too complicated for the average consumer to use. For the next decade at least, the key to the consumer's heart will be less in the technology itself than in the masking of technology to make it more user-friendly.

The exceptions will be those applications that save lives or promote public welfare. Exotic technologies, like virtual reality, can lower the overall cost of complex medical procedures. A VR-like "data fusion system" developed by Medical Media Systems in Hanover, New Hampshire, enables doctors to re-create remote organs, like the liver, and "watch" the endoscopic removal of a tumor. Tests on animals are under way now; human trials begin in July. Even at $80,000, the system is cost efficient.

FAR SIMPLER COMBINATIONS OF technologies could be used to create highly efficient urban-transportation systems. Buses, subways and private cars would be superfluous under a plan proffered by Nobel laureate Arno Penzias at Bell Laboratories. In his vision, a fleet of passenger vans, each equipped with a global-positioning system and cellular phone (plus whatever amenities its operator chose to offer)—all linked by computer to a central dispatching program, would provide total customized coverage of every street and every neighborhood in town, 24 hours a day.

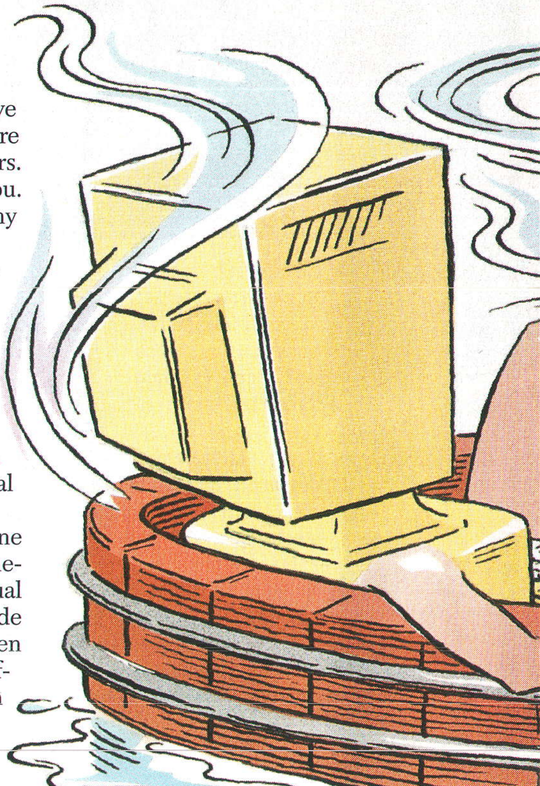
Through the computer and the cell phones, drivers would receive destination instructions; using GPS, dispatchers would keep tabs on the real-time progress of each vehicle. Passengers would call up the service, be met with minimum delay, transfer only if necessary and relax while professional drivers took them to their desired destination—say, that quaint little farmers' market on the far side of town, where the vegetables are always fresh but they don't take credit cards. In that case, you'd better hope there's an ATM around. ***—Reported by John F. Dickerson and Jeffery C. Rubin/New York, David S. Jackson/ San Francisco and Lisa H. Towle/Raleigh***

The smaller ones, costing about $5 each, will be used like Post-it notes stuck on the fridge

Twilight Zone Of the Id

Today online sex is as wild and far ranging as the human imagination

By GERARD VAN DER LEUN



THE JOINT IS CALLED #HOTtub (pronounced "pound hot tub"), and it's open almost all the time. I've been soaking in it for two hours with "Bubbles," "Hard Charger" and "Lush Lady." Charger and Lady are, shall we say, flirting heavily, while Bubbles is trying to get my attention. But s/he's a notorious transvestite, so I'm keeping my distance. People float in and out of this hot tub, which is open to all comers, but no one ever gets wet—just a little damp sometimes. If you fancy someone, and he or she fancies you, it is possible to go private and exchange sexual fantasies until you're too exhausted, or bored, to continue.

This steamy place doesn't exist in the physical world. It is a "channel" on Internet Relay Chat (called IRC among netheads). IRC consists of a series of real-time discussions on the Internet. Think of it as CB radio that you type instead of speak. Any number can play. And lots do.

A maze of steamy places that don't exist makes up the warp and the woof of sex on the Net today. The fact that virtual sex happens on the Net upsets a lot of people. Unfortunately, sex on the Net turns on a lot of people too. I know. I've been covering sex on the networks for nearly 10 years. Strictly as a professional, of course. I've seen things that would make William Burroughs blush. I've had a chance to order whips and chains by the gross, drop in on group sex and download more explicit pictures than are displayed in a decade's worth of *Hustler*. In one day, I've read more intimate confessions than are found in a year's worth of *Penthouse* letters. All this as an objective journalist, mind you. I report on cybersex, but I don't give it my essence.

Gerard van der Leun is a writer, editor and veteran observer of all major online systems and the Internet.

Today online sex is as wild and far-ranging as the human imagination—a real Twilight Zone of the Id, which causes one to reflect on whether or not the human race is indeed an evolutionary cul-de-sac, until you remember that cybersex has been going on since humans received the gift of imagination. Cybersex is, at bottom, simply old sexual fantasies in a new electronic bottle.

As with all other new mediums, online draws its energy from the same two timeless topics: radical politics and sexual fantasy. They are the first uses made of any new means of communication when it becomes popular, widespread and affordable, and they recede as the medium matures. The printing press has a long history of revolutionary tracts, such as Tom Paine's *The Rights of Man* and Jefferson's Declaration of Independence—along with what are now erotic classics, such as the Marquis de Sade's *The 120 Days of Sodom.*

In the 19th century, photography gave us historic images—pictures of Abraham Lincoln—and naughty photographs, sold under the counter. You can be sure that the first obscene telephone call was placed not long after the Bell Telephone Co. connected the first network. As for the first phone sex? That was probably the first obscene phone call in which the recipient didn't hang up.

When the movie *The Birth of a Nation* was released in 1915, the erotic film *A Free Ride* was circulating through the men's smoker circuit. The explosion of VCRS coincided with the release of videotaped versions of such porno classics as *Deep Throat* and *Behind the Green Door.* Sales of video cameras didn't explode just because people wanted to tape their holiday celebrations and stupid pet tricks. As iceskater Tonya Harding and her former husband reaffirmed, lots of videotape is recorded in bedrooms.

Now computer networks are the hot new medium, and, like all those launched before, they rely on radical politics and sex as primal energy sources. In cyberspace there is an ever-expanding menu of places to visit and sexual material from which to choose. Some people roam the networks collecting massive amounts of what, in its more sophisticated versions, is termed erotica. Most of it, frankly, is smut.

There are endless text files describing sex with strangers and strange sex. There are photos and films and sounds (*Girl in Cage*, *Women in Wet Clothes*) to download that are usually found behind the curtain in the back of mom-and-pop video stores. There are personal ads of the ilk published in the back of swingers' magazines: WANTED TOPLESS MAID CLEVELAND AREA. One can order sex toys of the inflatable and battery-driven varieties, available via dedicated numbers and direct mail. There are costumes (men's black leather harness with silver studs) and condoms, leather and rubber goods, the full catalog of kink—if, of course, you are a consenting adult with some room left on your credit card. The price of ordering the John Wayne Bobbitt video, *Uncut:* $49.95.

Many people like to have this electronic sex in real time and become fixated on "chat"—a kind of phone sex pecked onto a keyboard. Chat on the major online systems has been a dependable cash cow for nearly a decade, and, at rates from $2 to $12 an hour, it is easy to understand why.

Others use the medium as a pickup bar and a place to set up real assignations in the no-tell motels of America. The real cybersex conquistadores employ the networks to seduce distant lovers and keep a kind of score of their "hits." Not everyone who does this is male, by the way. Indeed, recently on America Online, a woman with the handle "Stolen Kisses" became the object of many others' fancy after she wrote an article in *Penthouse* magazine titled "Confessions of a Cyberslut." While it was once the case that women willing to engage in erotic give-and-take on the networks were in short supply, they are becoming much more prevalent as the medium expands.

ROBERT GROSSMAN FOR TIME

Yes, it's also true that lots of people fall in love over the Net, meet, get married, have children and go on to live decent lives as upstanding members of their community. But most who venture into the explicitly sexual arenas of cyberspace do so for the freedom it affords them. One of the benefits of cybersex is that you get both to meet and *to be* new people every day. If you learn how to use the anonymous-posting programs that are proliferating, you don't even have to reveal your real name or location. You can be utterly untraceable. Another benefit is that since no one can see you, you certainly don't have to look your best. Yet another plus is that you can, to a certain degree, experience and understand life-styles that you would never dream of trying in real life. And, of course, the safety of virtual sex is unparalleled. The only viruses that can be transmitted in cyberspace are computer viruses. While annoying, they tend to let the users live.

The downside is that, especially on the Internet and the adult bulletin-board systems, many people are going to see, hear and read things that are intensely pornographic. Some are not going to like it. Just knowing that this is going on will drive lots of people, including ambitious public officials, to "do something" about it. Another problem with cybersex is that it can be addictive and chew up large amounts of money. And it tends to leave a lot of things lying around in your computer that you surely wouldn't leave out on the coffee table. I mean, face it, how many people brag about the collection of X-rated videos in the back of their bedroom closets? There is no life-style, life-form or item of furniture in cyberspace that does not become—sooner or later—part of some cybernaut's sexual fantasy. Some of the most popular *alt.sex* groups carried on the Internet provide lascivious text, images and sounds for the wired world, all day every day. Three of these such groups are *alt.personals.spanking.punishment*, *alt.sex.fetish.fashion* and *alt.sex.strip-clubs.*

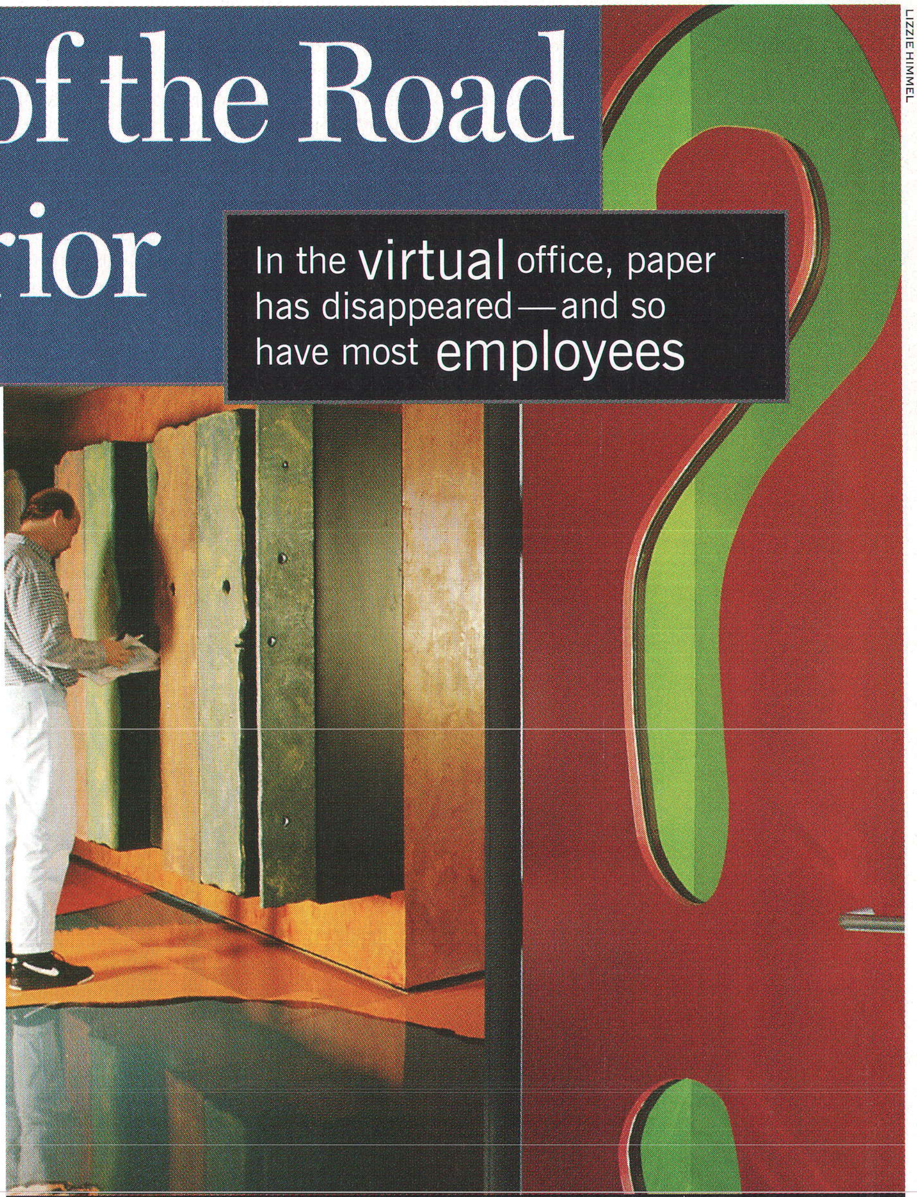
IS THIS KIND OF THING GOOD OR BAD? That's an argument that's probably been going on since the first crude painting of a naked person was drawn on the wall of a cave. Does cybersex conform to community standards? The idea of community standards starts to evaporate when the "community," like the Internet itself, is global. The large commercial online "communities" like CompuServe and America Online expressly forbid the posting of any explicit sexual material. Since, by popular demand, they are providing increased access to the Internet, however, they do allow you (after many disclaimers) to add the *alt.sex* groups to your personal inventory of Usenet newsgroups. Besides, the "private" chat rooms on both these services are notorious cyber-fleshpots.

In fact, the most unnerving encounter I've ever had took place in the CompuServe adult-chat area. I won't go into it in these pages, and I shudder to think about it. To this day, I'm not even sure about the genders or species of the people involved. I dimly remember the names "Michael," "Lisa," "Pee Wee," "Jo Jo," "the Bong" and "Elvis," but after that, everything is a blur. ■

Age of the Road Warrior

In the virtual office, paper has disappeared—and so have most employees

By LEON JAROFF



At Chiat/Day's digs in Manhattan, above, and Venice, only lockers and portable technology remain

LIZZIE HIMMEL

EVEN IN VENICE, CALIFORNIA, with its bizarre assortment of skaters, body builders and semi-nude exhibitionists crowding the famed boardwalk, the building at 340 Main Street is an attention grabber. The three-story edifice, headquarters of the Chiat/Day advertising agency, is wrapped in brick beams and topped by a concrete slab, and its entrance is straddled by a pair of 30-m-tall black binoculars. Inside, the building is even more remarkable. Gone are the choice corner offices where agency executives once held forth, the cubicles once occupied by their secretaries, the once ubiquitous rows of filing cabinets. Executive chairs have been replaced by couches, business phones by the portable, flip-top variety. The only spaces left that employees can call their own are the red, green, blue and black high school–style lockers where they stow their personal belongings. Unanchored, workers move about wherever their business takes them. Given the choice of working where they please, nearly half the staff telecommutes either from home or from the road, keeping in touch by pager, cellular phone, fax, computer and modem.

Welcome to the virtual office, a glimpse into the information age, which promises to change the way business does business. Some 3 million employees of U.S. companies already telecommute, performing all or part of their work away from their offices, and their numbers are increasing some 20% every year. The trend is likely to accelerate with the arrival of newer, more user-friendly technology designed specifically for mobile employees—or "road warriors," as they are called. The impact could be profound, and not necessarily all for the good. For one thing, managers and workers will have to make difficult psychological and social adjustments. For another, restructuring is sure to produce some unexpected costs, both financial and managerial.

The transition at Chiat/Day, which announced plans in January to merge with TBWA International, was abrupt: just six months to transform the workplace from conventional to virtual. Now, employees who choose to go to the office on any given day stop at a "concierge's desk" in the lobby to pick up laptop computers and portable phones, which can be programmed with any employee's extension. The workers then head for any one of a dozen or so living room–like settings in a large, red-carpeted open area, plug into nearby modem jacks and get cracking. For the occasional meetings of working groups, several "strategic business units" (conference rooms) have been set aside, but they are practically the only enclosed spaces.

Other than personal stationery and files stashed in each employee's private locker, paper has all but vanished. Faxes and memos show up on personal computer screens, and messages are left on voice mail. Documents once stored in filing cabinets are available only electronically on any of several computer terminals conveniently scattered around the premises. Clients can selectively tap into the firm's computer system to view advertising strategies and even critique new concepts.

Though perhaps not with the flair of Chiat/Day, other big companies are also

DAVID STRICK—ONYX FOR TIME

experimenting with the virtual office. IBM, at which mobility is mandatory for more than 13,000 sales, marketing, technology and administrative staff members, has outfitted these employees with PCs, printers and fax-modems, enabling them to work away from its central offices. The computer giant's Denver operation, for example, was able to reduce its office space from nine floors to four, and it projects savings of $6 million over five years.

Ernst & Young, America's second biggest accounting firm, is in the process of eliminating 50% of its total U.S. office space by converting most E&Y accountants and consultants into part-time telecommuters who must literally make reservations to use the remaining offices. Under a system known as "hoteling," E&Y employees in need of space must book at least one day in advance. Each office is equipped with the necessary hardware—as well as room for a few personal belongings, like portable pictures of the family. A similar switch to telecommuting and hoteling by the Chicago staff of industry leader Arthur Andersen & Co. enabled the firm to reduce the number of individual offices by nearly 100, saving more than $1 million annually.

Converting to the virtual office can be costly, however. At the CKS Group, a Cupertino, California, advertising agency, about a quarter of the agency's 160 employees work elsewhere, using the cellular phones, pagers and PDAS (personal digital assistants) supplied by CKS to help them keep in touch. Not only does the firm pay half the purchase price for a staff member's home computer, but new technology is costing CKS an additional $10,000 to $15,000 per employee each year. CKS president Mark Kvammi estimates that technology expenditures amount to about $2 million every year. And the technology keeps getting more sophisticated. At the end of last year, for example, AT&T introduced PersonaLink Services, a package of communications software that facilitates computer, phone, fax and paging functions in hand-held personal communicators such as Sony's Magic Link and Motorola's Envoy; soon the AT&T interface will provide expanded wireless connectivity and be usable almost anywhere but underwater.

In the rush to embrace virtual-office technology, some managers may not be giving enough consideration to the psychological impact of the change. Executives who have labored for years to win such corporate status symbols as secretaries and luxurious corner offices are reluctant to shed their hard-won perks. Ambitious junior managers, mindful of the old adage "Out of sight, out of mind," resist spending too much time away from headquarters. For employees whose social life revolves largely around their co-workers, the transition can also be wrenching. Some complain that their creativity, stimulated in part by informal corridor chatting or lunches with fellow employees, has been dampened. Even at Chiat/Day the metamorphosis has not been easy. "A lot of people left," admits Tony Stern, the firm's creative director. " 'It isn't what I want,' they said. 'It's too hard for me.' "

BUT TECHNOLOGY THAT TAKES personal interaction away can also make up for it in new forms. At the New York City office of Chase Manhattan's Private Bank, executive vice president James Zeigon is able, with the click of his computer mouse, to dial his London and San Francisco branches and within five seconds conduct a "face-to-face" meeting with two colleagues thousands of kilometers apart. Using an advanced teleconferencing system from Avistar, the Chase bankers get consistently sharp video images in synch with clear sound and smooth movement. Their system allows for the onscreen display of documents as well as people from up to four locations at the same time. The cost per seat for such systems currently ranges from $2,000 to $5,000, but it could decline, say analysts, to $500 during the next two years.

The combination of plummeting costs and soaring sophistication in communications technology is changing the nature of business competition. Newfound access to vast libraries of digitized data, combined with the means to communicate cheaply and rapidly, has given small firms tools that until recently were available only to big corporations. Properly wired, so-called mom-and-pop enterprises now have the wherewithal to compete without overhead costs to weigh them down. Conversely, many big American companies are finding it harder and harder to justify large proprietary staffs. To compete effectively with small rivals, many large companies have begun replacing those staffs with new digital gadgets in a process Bell Labs Nobel laureate Arno Penzias calls "the hollowing out of corporations."

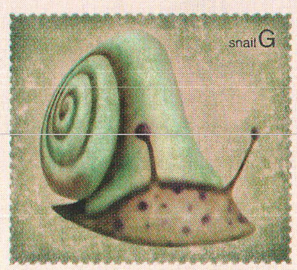
"What we're going to see over the coming two decades is the devolution of many large corporations," says Peter Schwartz, president of Global Business Network, a cyber-age research and consulting firm. Case in point: IBM. In the same massive restructuring that is bringing virtual offices and high-tech gadgetry to every level of its business, Big Blue has slashed its work force by more than 170,000 jobs since its employment peak in the late 1980s. Many of these erstwhile employees have set up shop on their own, often doing business on a contract basis for IBM itself. Thoroughly armed with the modern weaponry of the road warrior, they, like the telecommuters at Chiat/Day, are among the forerunners of employment in the information age. ***—Reported by David Bjerklie/New York and Patrick E. Cole and Dan Cray/Los Angeles***

SNAIL MAIL STRUGGLES TO SURVIVE

AS BUSINESSES BIG AND SMALL WIRE THEMSELVES INTO HIGH-speed electronic communications systems, their reliance on traditional mail will inevitably lessen. In the long run, that could leave the U.S. Postal Service, with its 40,000 branches, 780,000 employees and $50 billion annual budget, as one giant piece of roadkill on the information highway.

While the total volume of mail delivered by the U.S. post office has actually risen 5% since 1988, business-to-business mail during that same period dropped an alarming 33%. Most of that, the post office acknowledges, has been lost to fax machines, E-mail and electronic funds transfers. Among the many reasons: E-mail sent via the Internet arrives instantly, provided it is addressed correctly, while the post office is lucky to deliver 80% of first-class letters within three days—an average that has caused the netheads of cyberspace to dub it "snail mail." Moreover, one never reads about thousands of electronic messages being misplaced for years and turning up at the wrong address.

Even before the loss of traffic to the Internet and related technologies, government-operated mail service was losing the overnight letter- and parcel-delivery businesses to firms such as Federal Express and United Parcel Service. So far the post office has held its own because of the growing volume of mail between businesses and homes, mainly catalogs, credit-card offers, bills and payments. But as more private citizens get computer-connected, even that revenue source will face fierce competition from electronic shopping and banking services. America Online, for example, gives its members access to a service called 2Market, allowing them to browse for products online and order electronically. Since purchased goods are delivered by either FedEx or U.P.S., these transactions entirely circumvent the Postal Service.



RON PLYMAN FOR TIME

U.S. Postal officials counter that their service is truly universal, whereas their electronic predators are unduly optimistic about how widespread the new communications infrastructure will become. Faithful human couriers still haul letters by mule train to the Havasupai tribe in Arizona and don Santa Claus suits to deliver cards and presents at Christmastime. Besides, the 206-year-old service is planning for its survival—experimenting with ventures ranging from stamp collectors' services on CD-ROM to the certification of business-related electronic communications, similar to what it now does for postmarked, certified and registered mail. Another scheme would locate electronic kiosks in post offices, allowing Americans without private Internet connections to exchange E-mail and tap into online services offered by a growing number of government agencies, including the Social Security Administration and the Federal Communications Commission.

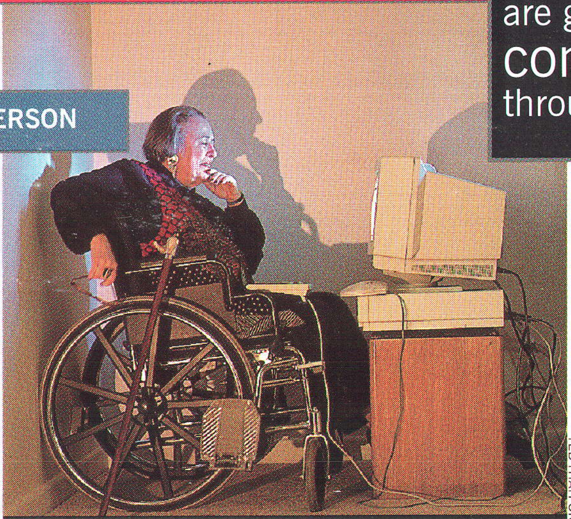
The trick will be to keep up with the competition while maintaining universal delivery. That famous promise—"Neither snow, nor rain, nor heat, nor gloom of night stays these couriers . . . "—engraved on New York City's main post office has a more reassuring ring to a citizen whose new 100-megahertz multimedia PowerPC just crashed for the third time. ***—By Suneel Ratan/Washington***

Never Too Old

Millions of senior citizens are getting connected through the Net

By JOHN F. DICKERSON

INSTRUCTOR GEORGE Breathitt asked an audience of 300 computer enthusiasts in Louisville, Kentucky, how many older people in the group would like to teach other seniors about computers. A younger member quipped disdainfully, "Wouldn't that be the blind leading the blind?" He was promptly booed: almost half the audience was over 50. In fact, Breathitt, 61, has attracted so many seniors willing to teach—and learn—about computers that he founded a successful firm to employ them. So far, his Silver Fox Computer Club has taught about 7,500 students and expanded into four states.



Weinberg now feels linked to both present and future

TED THAI FOR TIME

So who says computers are only for youngsters? The American Association of Retired Persons, the largest organization of senior citizens in the U.S., counts 2 million computer users among its 33 million members. With more leisure time and discretionary income than many youths, thousands of seniors—including many who have never before used a computer—are entering the cyberculture, burying the hoary old-dog-new-tricks axiom. "Once they get used to handling the mouse," says Breathitt, "they learn faster than teenagers."

Seniors are using their new computing power to do everything from monitoring investments to tracking genealogy to producing their memoirs. Some have started postretirement businesses making greeting cards or performing legal research on the Internet. But the majority say they were drawn to computers because, like Jack Fowler, 75, of Sun City West, Arizona, they simply didn't want to be left behind by progress. "I couldn't keep up with my four-year-old grandson," says the retired pharmacist.

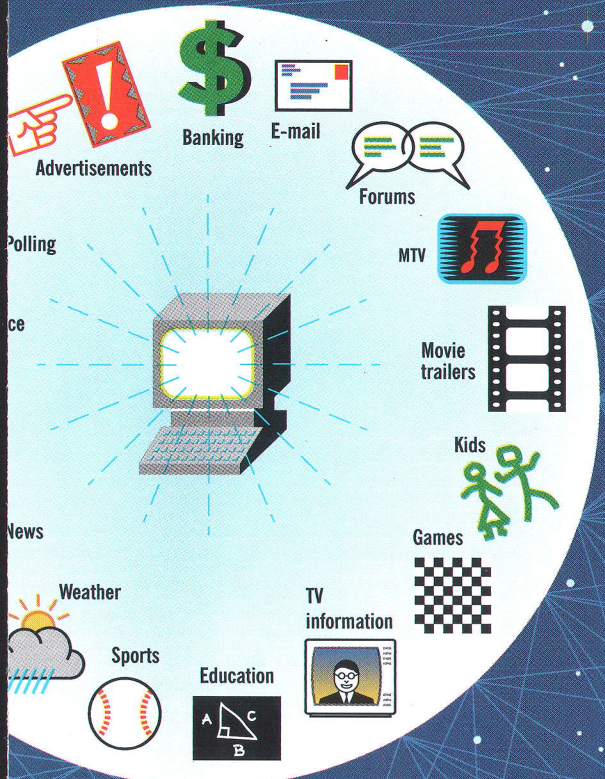
Ilene Weinberg, 68, a former social worker from Newton, Massachusetts, didn't want to get a computer; her typewriter worked just fine. But two years ago, her son gave her one anyway, hoping it might help make up for the debilitating effects of her Parkinson's disease. Now she spends so much time online that she has installed another phone line. "I feel like I'm with it," says Weinberg. "I'm connecting with the present and the future."

One of Weinberg's chief destinations is the 15,000-strong SeniorNet, where she spends several hours a day chatting with others her age in the organization's station on America Online. Many seniors find the network a rich source of new friends and support in time of trouble as well as a handy supplier of information on such subjects as how to light a water heater or handle depression. "For many older people, computers allow them to feel as if their world is still expanding," says Mary Furlong, who founded the San Francisco–based SeniorNet in 1986. "They allow you to form new friendships and become more intellectually mobile."

For Rick and Rita Hanson, SeniorNet has led to much more than intellectual mobility. In September 1993 the former truck mechanic and his wife traded in their Bellingham, Massachusetts, house for a mobile home and embarked on a nationwide tour. "We wouldn't have considered this trip if it weren't for SeniorNet," says 59-year-old Rick. "If one of us got ill, what would the other do? But now, no matter where we are in the U.S., we're within easy reach of friends." The peripatetic duo has gone from Thanksgiving in Las Vegas with 60 online friends to a wedding of two SeniorNetters in Michigan. "Lord willing, we'll see all 350 people in our computer family."

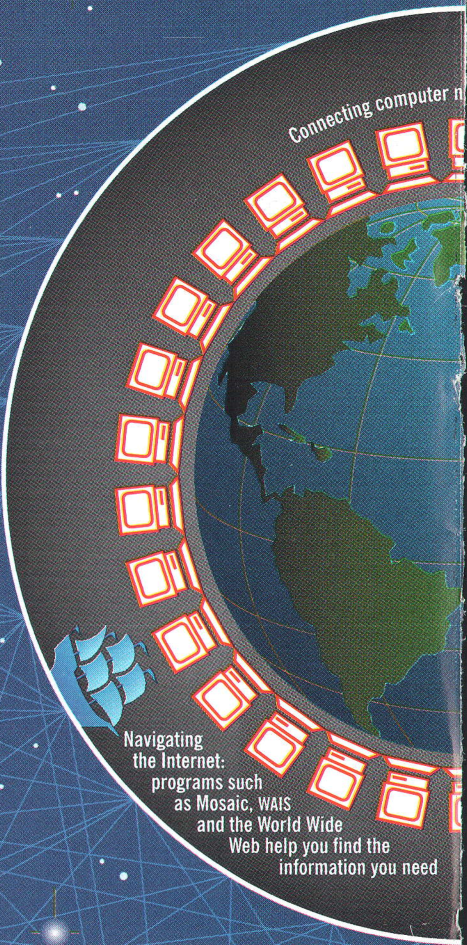
In addition to communicating with one another and sharing memories about everything from the Great War to the once ubiquitous Burma Shave highway ads, seniors are connecting with the generations below them. Children of aging parents log on for advice about health care and retirement communities or just to chat. On SeniorNet, several programs link schoolchildren and seniors. The Generation to Generation forum enables students to tap personal histories of World War I and the Depression, as well as lessons on aging. Says John Horn, professor of gerontology at the University of Southern California: "It's the equivalent of the old folks sitting around the village square."

Though seniors are far from being the dominant group among American computer users, their numbers are growing and are bound to mushroom as the baby boomers age. When that happens, they will feel right at home alongside the mass of younger users in the digital future. ***—With reporting by Kathy Shockett/Phoenix and Tara Weingarten/Los Angeles*** trial memberships to encourage new subscribers. Most services have a large choice of activities, and some are gateways to the Internet. Commercial services tend to be more regulated and better organised than the free-wheeling Internet.

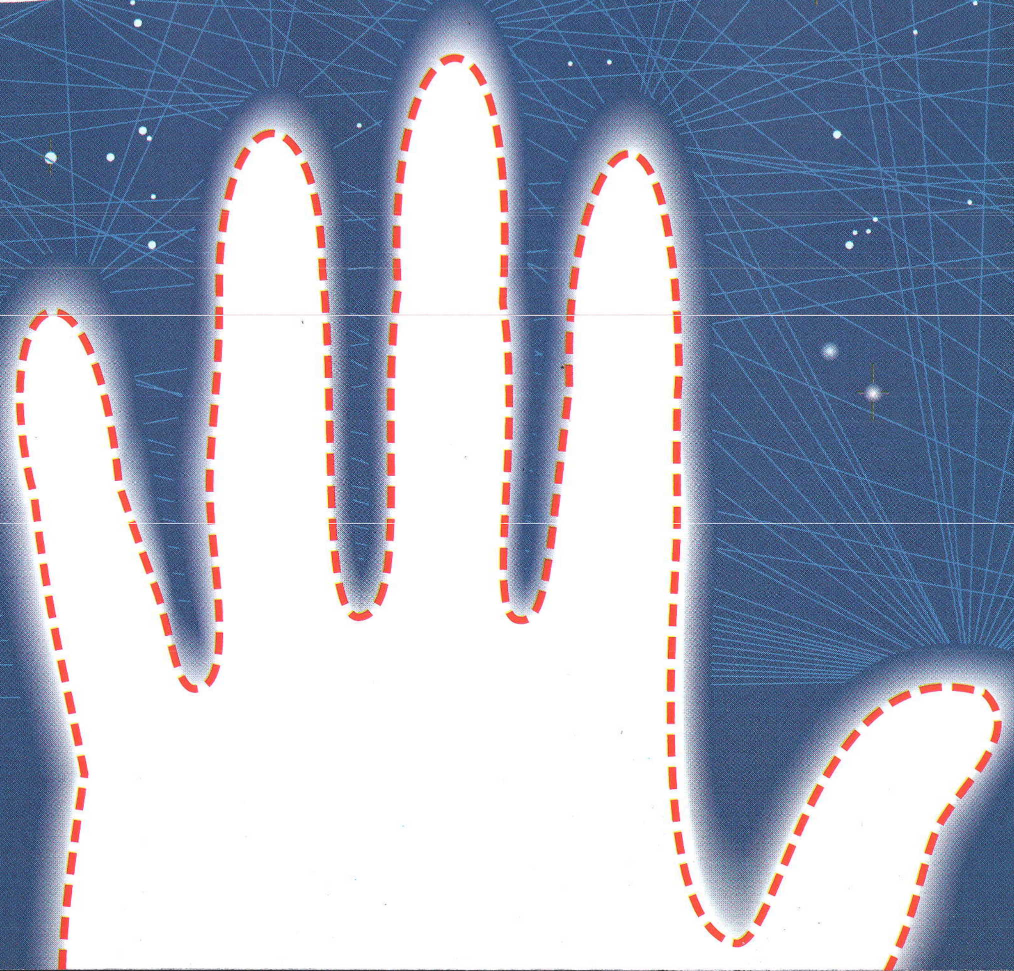


THE INTERNET

This is the term used to describe the global network of more than 46,000 interconnected computer networks. People can tap into the Net by logging on to their local access provider; this may be a commercial online service, a university, or other entity with access to the Internet. The bewildering maze of connections and hyperlinks facing the novice Net surfer can be simplified by the use of such programs as Mosaic and Netscape, which search different sites for the information you want.



Navigating the Internet: programs such as Mosaic, WAIS and the World Wide Web help you find the information you need

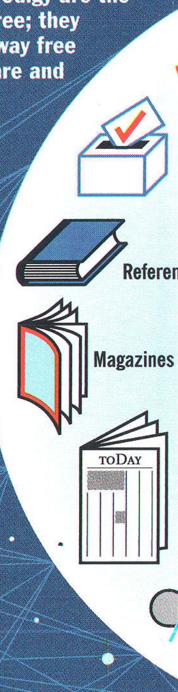


YOU CAN TOUCH CYBERSPACE

The new universe called cyberspace is made up of many "planets," shown here in their celestial orbits. Each plays an essential role in knitting together the vast network of modern communications. Increasingly, they are exerting a strong gravitational pull on our social and economic environments.

COMMERCIAL ONLINE SERVICES

These may be the best introduction to cyberspace. America Online, CompuServe and Prodigy are the big three; they give away free software and

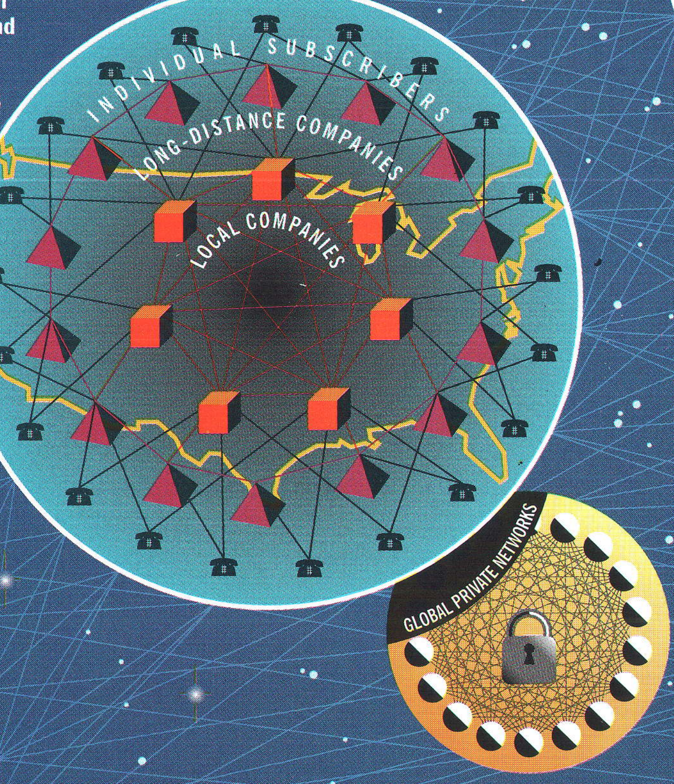


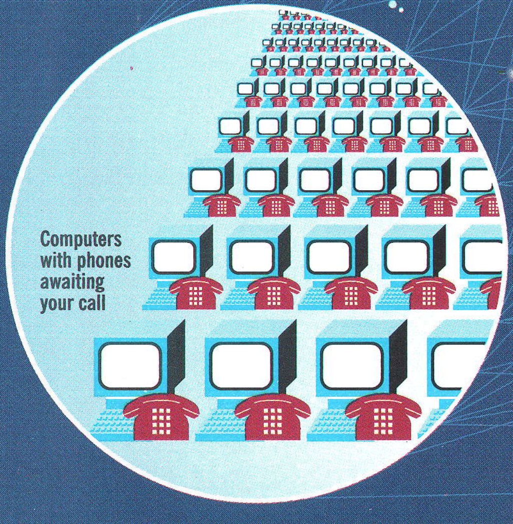
COMPUTER BULLETIN BOARDS

There are hundreds of thousands of bulletin-board systems in operation, most of them just a computer with a phone attached. You can dial into your local library catalog, check out Fedworld to see what the government is doing with your tax dollars, or browse porn sites around the world. BBSs were once discrete, disconnected systems, but it is now possible to transfer among some systems without hanging up and redialing.

TELEPHONE NETWORKS

Phone service in the U.S. is divided among some 1,300 local companies (including the seven Baby Bells, GTE, and other independent local companies) and more than 475 long-distance carriers (including AT&T, MCI and Sprint). In addition, 63 companies offer a combination of local and long-distance service in Canada. Voice and data can be delivered by various means—satellite, cellular and cable—as well as conventional phone lines.




Computers with phones awaiting your call

Guide to the Ways and

Most denizens of Cyberland would be apt to identify Emily Post as an electronic message from someone named Emily. But life on the Net has its own rules of etiquette—or **netiquette.** *Follow these dos and don'ts, and the natives might just think you've been wired all your life:*

Do Not Shout

Typing messages in ALL CAPS = shouting. Don't. A single word in uppercase for emphasis is fine, but not much more.

... But Speak Up

some folks err on the lowercase side. it looks just as bad. who do you think you are, e.e. cummings? The shift key is on your keyboard for a reason. Use It.

Stick to the FAQs

Every conference has a FAQ, a list of frequently asked questions. A good FAQ will offer newcomers a guideline that describes the subjects being discussed and gives advice on how to get extra readings and relevant software. FAQs will spare you from asking the kind of dumb question that draws a dozen flaming messages castigating you for wasting people's time.

"Smile" Discreetly

"Smileys" are those little graphical renderings used to convey facial expressions. They are also called emoticons. Just tilt your head to your left to view a :-) or its antithesis, which is a :-(. Some people love 'em; some hate 'em. They're used to denote feelings ranging from sarcasm to silliness. A well-placed smiley can be an excellent flame retardant, but some people badly overuse them.

No Parrots, Please

When responding to a posting, don't re-post the entire message; just quote the part you want to address, if even that much. The common method for doing this is to offset the part of the original post you wish to address with a > at the left margin of every line.

Please, No Commercials

Ads have their place in the online world, but make sure you understand just where that place is. The vast majority of Usenet groups eschew ads. Indeed, posting an advertisement in the wrong place will surely provoke a flame attack (a cascade of insults) and worse.

Lurk Before You Leap

Get a good fix on what people are talking about, what the general tenor is, what's already been said, before jumping into a conversation in a conference that's new to you. Unlike a conversation at a social gathering, you have the opportunity to review all that's been said before. Take advantage of it.

Don't Blow Smoke

Know whereof you speak. Don't pass along unsubstantiated rumors or anything you yourself don't believe to be true.

Don't Be the Skunk at the Picnic

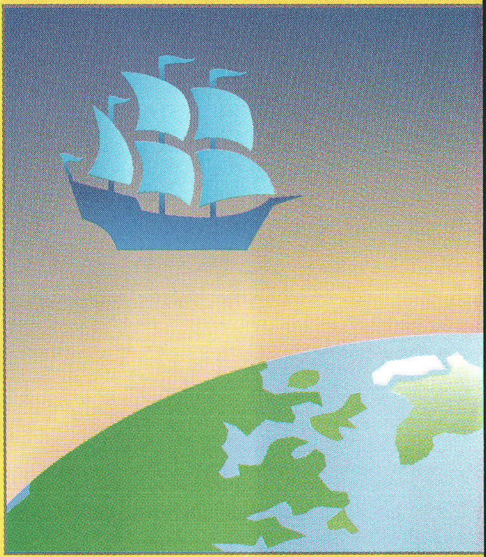
If you don't accept the underlying premise of a discussion group, don't disrupt it; just go away. An atheist, for example, needn't bother joining a conference of nuns who are debating church matters.

Think Twice, Write Once

Just as in real-speak, a thoughtless comment can cause pain, and pain usually leads to a flamewar with the recipient. A "written" word—even on a screen— has decidedly more staying power than a mere quip off the tongue.

Apply the Golden Rule

Do unto others in cyberspace as you would do unto them face to face, which is, of course, how you would want them to do unto you.



Lost on the ground floor of the Tower of Technobabble? Check out this **glossary** *of frequently used terms.*

- **BBS** For bulletin-board system; a congregation gathered (electronically) around a modem that allows users to post messages; they began as informal communities but now include political and even commercial categories.

- **bandwidth** The capacity of a cable, fiber-optic or copper-wire network, usually expressed in bits per second *(see below)*. The higher the bandwidth, the more users it can support, and the more those users are able to transmit and receive.

- **baud** The gauge used to measure the speed with which a modem *(see below)* transmits data; after Emile Baudot, a telecommunications pioneer. Its use is no longer fashionable, however, having been replaced by the more direct "bits per second," or bps.

- **beta** In the preliminary, or testing, stage, as in "they're still in the beta mode with that software."

- **boot** To start a computer; more frequently used as re-boot, since

Words of Cyberspace

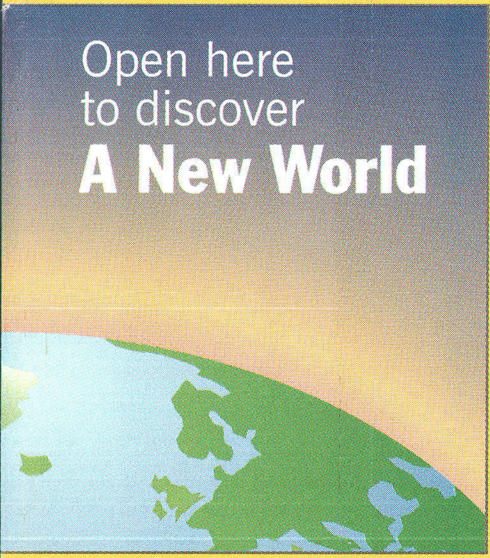


ILLUSTRATION FOR TIME BY NIGEL HOLMES

shutting down a system, then restarting —or re-booting—it tends to clear out bugs that are hampering smooth computing.

- **CD-ROM** Stands for compact disc–read only memory; one CD-ROM can hold about 600 megabytes, or the equivalent of 700 floppy disks.

- **E-mail** Electronically transmitted messages. If you didn't know this, go back to Page 1 and start again—carefully.

- **encryption** A method of securing privacy on networks through the use of complex algorithmic codes.

- **flame** An insulting message, usually in the form of a tirade, sent via online postings but also as personal E-mail. Flaming is the verb, and too much of it can cause a nasty flamewar.

- **gigabyte** A billion bytes, which is enough to hold 1,250 copies of Melville's hefty novel, *Moby Dick.*

- **hacker** Variously used to describe 1) a skilled programmer or 2) a skilled programmer with a mischievous bent, thus likely to try to intrude in others' areas.

- **host** A computer with full two-way access to other computers on the Internet. A host can use virtually any Internet tool, such as WAIS, Mosaic and Netscape.

- **hot chat** Sex talk, in real time, online, usually between two or more consenting people (though not necessarily adults).

- **hypertext** A link between one document and other, related documents elsewhere in a collection. By clicking on a word or phrase that has been highlighted on a computer screen, a user can skip directly to files related to that subject.

- **IRC** For Internet Relay Chat; a communications program that allows real-time conversations among multiple users; similar "chat" functions are the meat-and-potatoes of online services like America Online.

- **killer app** A particularly successful "application" of technology, one that clearly advances or broadens the use of the computer as a tool of everyday life—or at least the life of a computer user.

- **lurker** A visitor to a newsgroup or online service who only reads other people's posts but never posts his or her own messages, thus remaining anonymous.

- **modem** The device that allows a computer to transmit information over a phone line.

- **Mosaic/Netscape** Two of the most popular killer apps on the Internet. The first software that allows people to navigate—or browse—the World Wide Web *(see below)*, simply by pointing and clicking.

- **MUD** For "multiuser dungeon"; programmed renditions of rooms, compartments, worlds and time zones; used in computer games inspired by the original Dungeons & Dragons.

- **newbie** A newcomer to cyberspace; usually applied condescendingly—the way sophomores talk about freshmen.

- **node** Any device that is connected to a network. On the Internet: a "synapse" that stores or relays data that are moving down the line.

- **posting** A message—perhaps yours—on a bulletin board.

- **ROTFL** A popular online abbreviation, shorthand for "rolling on the floor laughing"; an appropriate typed response to a particularly amusing online remark. Other common Net acronyms include IMHO ("in my humble opinion") and IMNSHO ("in my not-so-humble opinion").

- **spam** Garbage, or junk postings, usually sent in large multiples; from the Monty Python routine of the same name. So labeling anything, however, might inspire a good flamewar. Also used as a verb, as in "I've been spammed."

- **sysop** A system operator, the overseer, operator, gatekeeper, referee and Mr. Fixit for a multiuser computer system or bulletin board.

- **surfing** Exploring the Internet; implies a leisurely approach without any particular goal in mind.

- **thread** A topic on a Usenet group; e.g., "Baby Bop's voice" as a subcategory, or topical thread, that readers may follow in the *alt.barney.die.die.die* newsgroup.

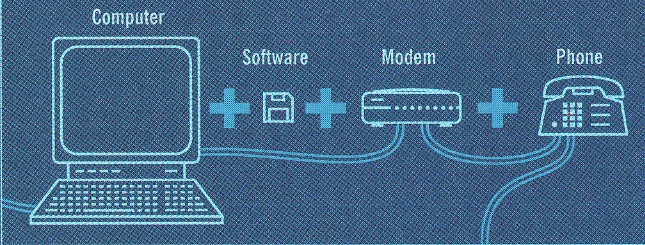
- **URL** For "universal resource locator"; an address for a "Website" *(see below)*, such as *http://www.timeinc.com* (which brings you to the opening screen—or home page —of Time Inc.'s own Website, Pathfinder).

- **userid** A compression of "user identification"; the unique account signature of an Internet user; that which precedes the @ (at) sign in an E-mail address.

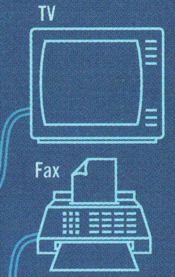
- **video on demand** An interactive system that allows you to point your remote at the TV screen and select any movie you want to watch from a library of titles, whenever you want to watch it.

- **World Wide Web** a.k.a. www, or just "the Web"; a system for organizing information on the Internet, using hypertext links. By pointing to a highlighted phrase and clicking, a user can effortlessly jump from one Website to another.

GETTING CONNECTED: HERE'S WHAT YOU NEED



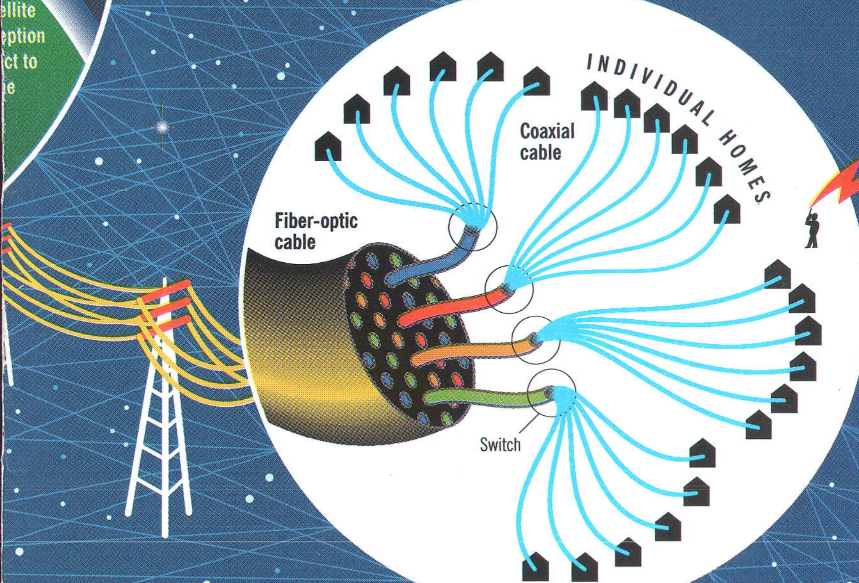
Computer and modem (as fast as you can afford) and phone: until now, these machines have worked independently in your home or office. Hooking them together will make you a full participant in cyberspace.



Getting fully wired doesn't mean throwing away your old machines. You will need the TV to get those promised 500 channels and other broadcast services (possibly through phone lines), and the fax will be necessary for the transmission of certain documents.

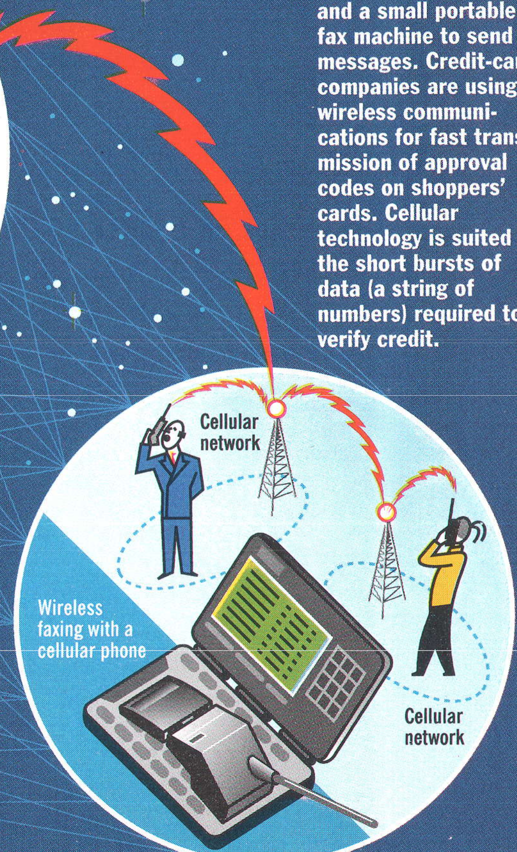
CABLE NETWORKS

Cable companies believe they will be the providers of choice into the next century. They argue that their coaxial cable connections from individual homes to superhigh-capacity fiber-optic backbones will change traditional one-way broadcast services to two-way interactive services. Fiber-optic technology has made it possible to deliver data to 500 homes over a single cable, and the cables provide consumers with more than enough bandwidth to send data the other way—to play multiparty games, to vote, or to have video-on-demand.



CELLULAR NETWORKS

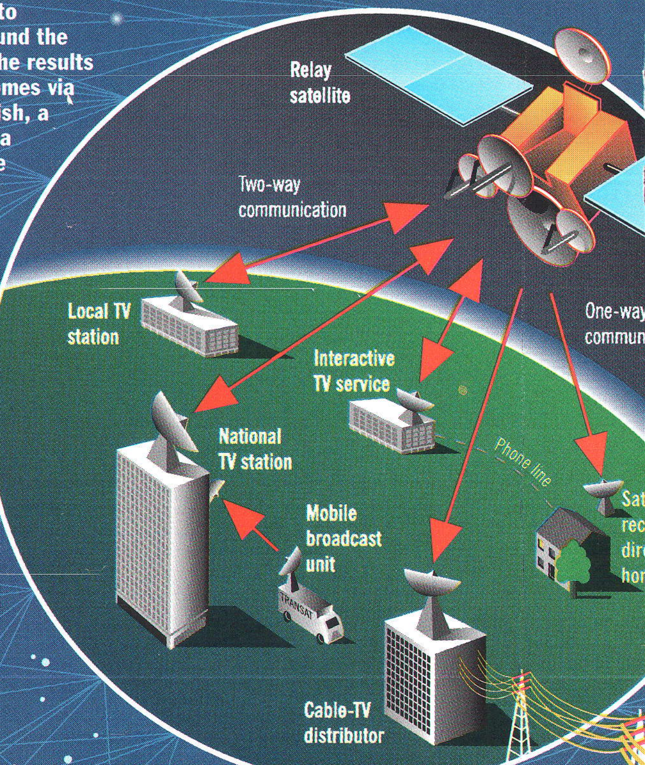
The newest and fastest-growing area of communications is digital cellular networks. An obvious advantage of wireless technology is its mobility, making it ideal for salespeople on the move. They can now call in new orders to a central warehouse directly from a client, or use a cellular phone and a small portable fax machine to send messages. Credit-card companies are using wireless communications for fast transmission of approval codes on shoppers' cards. Cellular technology is suited to the short bursts of data (a string of numbers) required to verify credit.


Cellular network
Wireless faxing with a cellular phone
Cellular network

Designed and drawn by Nigel Holmes

SATELLITE & BROADCAST TELEVISION

Relay satellites bounce our favorite TV programs from one station to another around the world, and the results enter our homes via a satellite dish, a TV aerial or a cable. As the idea of two-way, interactive programming becomes a reality, the broadcast industry will use more sophisticated means of transmission to enable users to talk back to their TVs. Eventually, TVs may become more and more like computers.



CYBERSPACE

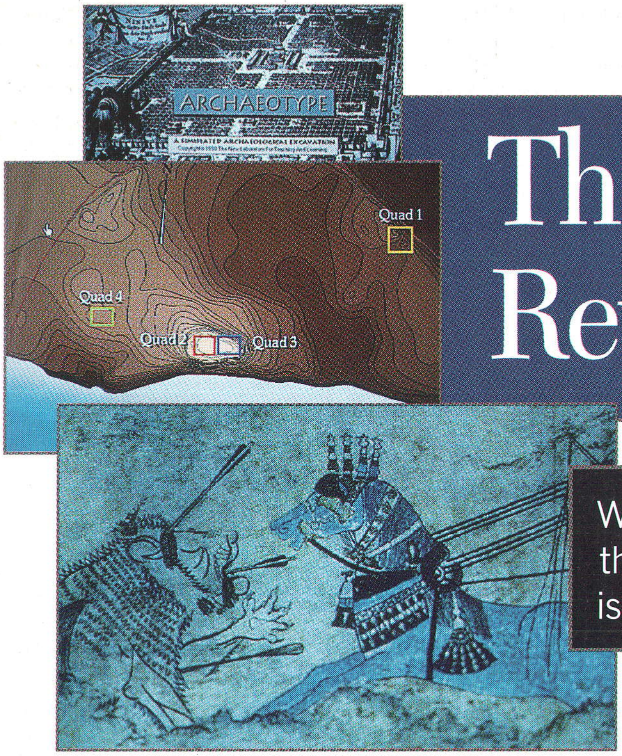
THE CYBER REVOLUTION

Cyberspace. The Internet. Virtual reality.
The information superhighway. Emerging
technologies are transforming your
business, entertainment, personal finance,
home shopping and more. This special
issue shows you exactly what it all means.
And if you're already plugged in, you can
experience "The Cyber Revolution" on the
Internet (http://pathfinder.timeinc.com).
Innovative companies, such as Apple and
Kyocera, support TIME in bringing a
new understanding of the future
to Europe and the world.

VIRTUAL REALITY

THE INTERNET

INFORMATION SUPERHIGHWAY



The Learning Revolution

By CLAUDIA WALLIS

What wondrous things occur when a school is wired to the max

When the computer first entered the American classroom three decades ago, prophets of the information age foretold a marvelous revolution. The world's storehouses of knowledge would become instantly available to young minds. Captivating digital landscapes would bring history, geography and science alive on a screen. Not since Gutenberg, they exulted, had there been such a powerful new tool for learning. Their bold predictions were not wrong, just premature. Computers are indeed everywhere in American schools, but they are generally used as little more than electronic workbooks for drill, or as places for kids to play games during "free choice" periods. The promised revolution has failed to materialize.

But here and there, in cutting-edge schools around the U.S., there are glimmers of what could be. Nowhere is the use of technology more advanced and pervasive than at the Dalton School, an élite private academy in New York City. The 1,300 students at Dalton, situated on Manhattan's posh Upper East Side, enjoy resources that any school would envy: a teaching staff studded with Ph.D.s, a 62,000-volume library and specialized studios for instruction in subjects such as architecture and dance. But what really distinguishes the school is the way it is using technology to change the traditional roles of the teacher as oracle and the student as passive receptacle for hand-me-down knowledge. A visit to some of Dalton's classrooms provides a glimpse of what many believe is the future of education:

▸ Room 711. A faint scraping sound can be heard in Mary Kate Brown's sixth-grade social studies classroom. The students are on a dig. Each group of three or four has been assigned a plot within an ancient Assyrian site. Their mission: to uncover what is at the site, to analyze carefully each artifact they find, then to formulate and defend a thesis about the nature of the place and the people who once lived there.

Not even well-heeled Dalton can afford to take an entire class on an excavation in the Middle East, so these students are working on Archaeotype, a computer simulation of a dig—shoveling sounds and all—created at Dalton and based on an actual site. Still, the excitement of the hunt is palpable. As they uncover spearheads and ivory pieces on the screen, these 11-year-olds speak of "stratification" and "in situ artifacts" with near professional fluency.

This is a course in which kids learn by doing—absorbing science and ancient history through acts of discovery. "The material they find will admit of a variety of explanations," says Brown. "There is not just one right answer." To marshal evidence for their theories, students may consult Archaeotype's six online "libraries" of scholarly information and images (military, religious, royalty, etc.) as well as the greater resources of Dalton's library or even the Assyrian collection at the nearby Metropolitan Museum of Art. "It was like our own little land inside the computer," says Laura Zuckerwise, 12, who completed the course last year. "If we found a new artifact, it was as though we were the first people to discover it!"

▸ Room 608. Like generations before them, the students in Jacqueline D'Aiutolo's 10th-grade English class have begun the epic journey into the dark heart of Shakespeare's *Macbeth*. They have completed reading the play, and now, working in groups of three or four, they are digging deeper into the text. Each group sits before a Macintosh computer, linked to an elaborate data base.

Three students have been exploring the character of Lady Macbeth for a joint paper. What does she look like? How should she be imagined? A few keystrokes bring up a series of images: illustrations of the conniving noblewoman by a variety of artists, then a scene from Roman Polanski's 1971 film, *Macbeth*. As the action plays out in a window on the screen, the students discuss the lady's greed and her striking resemblance to a witch in the opening scene of Polanski's film. They can also look at scenes from the 1948 Orson Welles production and a 1988 staging for British TV. As they form theories about Shakespeare's intentions, they may consult any of 40 essays and hundreds of annotated bibliographies, as well as writings about the Bard's life and times.

Jacqui D'Aiutolo circles the room as her students work. She has been teaching *Macbeth* for more than 15 years and, though she first regarded computers and literature as "strange bedfellows," she has been amazed to see how students can deploy this modern tool to plumb the meaning of old texts. She has found that her own

TED THAI FOR TIME (3)

role has changed: she is less a lecturer than a resource and guide, helping the 16-year-old students refine their own questions and assisting in their search for answers. The incisiveness of their work has stunned her. Says D'Aiutolo: "You have depths you would never expect to reach in a 10th-grade class."

▶Room 307. There's an audible hum in Malcolm Thompson's classroom, known at Dalton as the "AstroCave." Seven computers are in use, each surrounded by a clutch of students murmuring in continual discussion of their work. The place is littered with 10½-in. (27-cm) square Palomar plates—grayish films, sprinkled with dark points of light representing stars and nebulae that were recorded by the 48-in. (122-cm) telescope at California's Palomar Observatory. Each student has chosen three stars and has been asked to calculate their brightness and temperature based on what the pupils see on the plates and can glean from a computer program called Voyager. Unlike Archaeotype, Voyager is an off-the-shelf program, but it is a tool of awesome power, simulating a view of the heavens from any point on earth, at any time, past or present.

Thompson's course has always been popular, but in recent years it has achieved an almost cultlike status at the school. Though a vivid lecturer and the co-author of what was for years America's top-selling astronomy textbook, Thompson has traded the chalk-and-talk approach for a task-oriented mode of teaching, using Voyager. His students do not "study" astronomy; they become astronomers. From September through June, they complete a series of tasks, using computer-based tools like the ones astronomers use. Each task builds on the ones before it, so calculations made in October may provide an essential tool for November's assignment. Thompson's students admit they often begin hopelessly lost until, by dint of their own collaborative labors and their teacher's counsel, they find their way. "It's the biggest satisfaction," says Simon Heffner, a senior. "You don't realize you understand it and then it hits you!" In the end, adds Thompson, "they have knowledge that they can deploy, as opposed to just passing a test."

IT IS NO COINCIDENCE THAT DALTON began its plunge into technology with the Archaeotype program. Excavation is an apt metaphor for the kind of "constructivist learning" promoted at the school: students must actively dig up information, then construct their own understanding from raw, observable facts. What the technology does is extend experience so that many more observations are possible. "It shifts education from adults giving answers to students seeking answers," says headmaster Gardner Dunnan. The underlying premise: we all understand and remember what we have discovered for ourselves far better than what we have merely been told.

Still, the guiding hand of the teacher is a vital element in the process. "You can't just give kids powerful computers and powerful information and set them loose. The teacher must create a compelling set of educational questions," says associate headmaster Frank Moretti, who heads Dalton's technology group, the New Laboratory for Teaching and Learning.

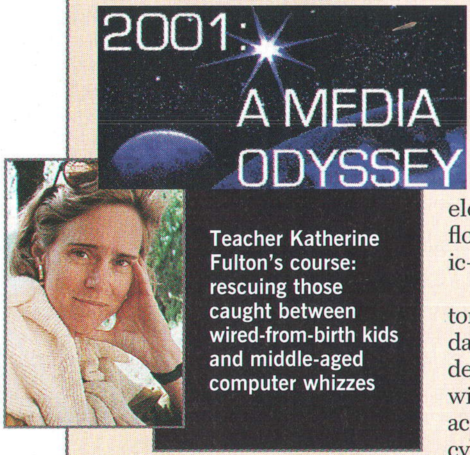
The effectiveness of Dalton's program

CATCHING UP TO THE DIGITAL FUTURE

DUKE UNIVERSITY SENIOR PARKER HOBSON KNEW "PAINFULLY little" about computers and modems, let alone the Internet, when he decided last September to take a course called 2001: A Media Odyssey. Like several of his classmates, he had never even used E-mail before. After 14 weeks of training under the direction of new-media journalist Katherine Fulton, however, Hobson and his 15 classmates were changed forever. From skeptical techno-Philistines, they had been transformed into fully rated Internauts, ready and eager to navigate the digital future. As he finished creating a home page on the World Wide Web, Hobson admitted, "I'm amazed that I knew so little when I started this course."

Duke's introduction to cyberspace is carefully tailored for the current generation of American college students, who can find themselves caught between middle-aged computer whizzes and elementary school kids who seem to have been wired since birth. During the first month of her course, teacher Fulton, who designed the class two years ago, exhorts her students to conquer the Net before they do anything else. They become comfortable using BBSs (bulletin-board systems), IRC (Internet Relay Chat), MUDs (multiple-user dungeons), Usenet newsgroups and such World Wide Web browsers as Mosaic and Gopher. But Fulton also engages them in discussions of related social and political issues such as privacy, universal access and the role of governmental regulation.

2001 is on-the-job training: Fulton requires her charges to E-mail their questions and comments to a list of their classmates, a task that stimulates student participation. Classroom discussions thus quickly spread outside—in fact, right into cyberspace. Says senior Cara Chotiner: "I learned so much by reading what people wrote—things that they didn't have time to say in class." As so often happens on electronic message boards, tongue-tied wallflowers blossomed into confident—and prolific—E-mail correspondents.



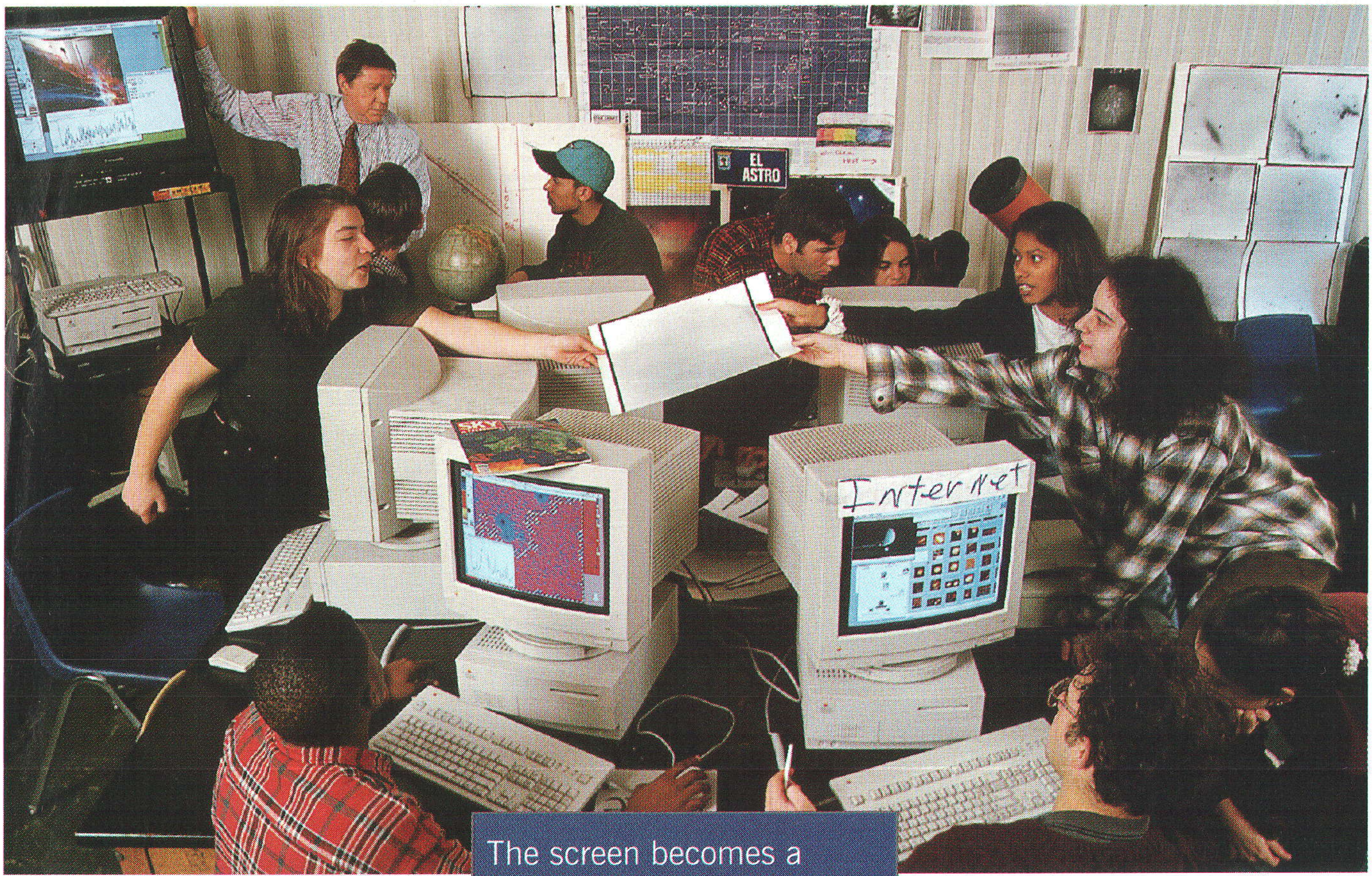
KATHY KUNST

Teacher Katherine Fulton's course: rescuing those caught between wired-from-birth kids and middle-aged computer whizzes

Their final projects reflect just how far Fulton's students have traveled from their first days as computer innocents. Second-year student Rebecca Jones analyzed teleshopping with an eye toward the future of cashless transactions, while Nikolai Mamyrin explored the cyberfrontier of his native Russia. Each of the projects can be accessed on the class's World Wide Web home page (*http://www.duke.edu/~peh*), co-designed by Hobson, Seth Squadron and Brian Thompson as their own final project.

Though the quick pace of change ensures that Duke's 2001 is little more than a stopgap remedial course for the time being, Fulton's students will nonetheless graduate with valuable basic knowledge of the modern tools of communication. Soon after the new millennium rolls around, however, such a catch-up Odyssey will probably be unnecessary—at Duke or anywhere else. By that time it will have become the 21st century equivalent of that 1950s relic, the typing class.

—By Jeffery C. Rubin/Durham



TED THAI FOR TIME

The screen becomes a landscape to explore, offering a view of the stars or an ancient site to excavate

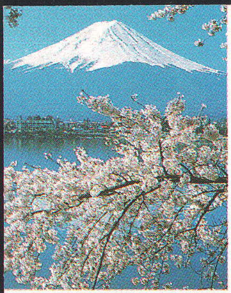
has been closely observed by outside experts. The school hired John Black of Columbia's Teachers College to conduct a study comparing the analytic skills of Archaeotype students with sixth-graders at a similarly élite private school. "Kids at Dalton were twice as good at devising an explanation of data and defending it," says Black. "I've never seen such a big difference in an educational study." On the other hand, the new teaching methods mean sacrificing some breadth for depth. Sixth-grade history, for instance, no longer covers the Middle Ages or Rome, since so much time is devoted to Archaeotype.

The goal of any school is to prepare students for the world in which they will live. Dalton's emphasis on collaborative learning—those little groups around a computer—"is perfect preparation," says Moretti, for a world in which most problems, whether scientific or corporate, are addressed by teams. Students often produce their papers collectively. Increasingly, projects are composed in the same multimedia format used for instruction. In addition, students are being primed for the world of the Internet by taking part in the school's own E-mail and bulletin-board system. They log onto the Dalton Network from home or at school to "chat" with friends, confer with teachers or join online discussions of movies and records.

The most remarkable feature of the system, however, is the "conferences"—discussion groups associated with certain courses. This year's most popular spins off a senior-class seminar in civil rights. Not only do all 17 students in the class participate, but twice as many outside the class have joined in. An additional hundred or so just log on to read what's been said. The exchange, moderated by the teacher, is both analytical and heated, especially on divisive topics like affirmative action. Observes Moretti: "When children begin to take their own time outside the classroom to respond to questions that are important to them and become identified with positions within the larger community, that is a kind of personal development that wasn't possible in the old-fashioned school."

How relevant are Dalton's experiments to all those old-fashioned schools across the U.S. with strained budgets and less privileged kids? Very relevant, insists headmaster Dunnan. Sure, it takes serious money and expertise to create something like Archaeotype, he concedes. (Dalton received $3.7 million from real estate mogul Robert Tishman to develop technology.) "But once something is developed, it need not be very expensive." To prove that point, Dalton has begun to offer its learning technology to a few public schools. The Juarez Lincoln Elementary School in Chula Vista, California, for instance, has been using Archaeotype for three years, much to the delight of its largely poor and ethnically diverse students. Ultimately, Dalton hopes to be able to bring its technology to market.

Alas, sharing software alone will not bring about the education revolution. Few schools today have the computing power to run multimedia programs like those used at Dalton. Fewer still have the resources to support a complex schoolwide network (though increasingly schools can connect to existing networks). Still, anyone who has seen what technology can do for learning is convinced of its future. "There's something inevitable about this," says Christina Hooper, a Distinguished Scientist at Apple Computer and an expert on educational technology. She believes it may take 10 years, or more likely 20, before the technology is widespread, but the prophets of the post-Gutenberg age in education will finally be proved right. ■



KYOCERA

A generation ahead

Kyocera Corporation was founded in 1959 as a manufacturer of ceramic products. It is now one of the world's largest producers of advanced ceramic-based technologies, with a turnover of about $4.2 billion in 1994.

From a solidly founded base as a manufacturer of fine ceramics, Kyocera has steadily expanded its product line. This is a constantly evolving process, using the advanced technology in research and development to find new applications and new markets.

Kyocera manufactures a wide range of ceramic-based solutions in the fields of electronics, telecommunications, optics, medical parts, bioceramics, solar energy and information technology products - to name but a few.

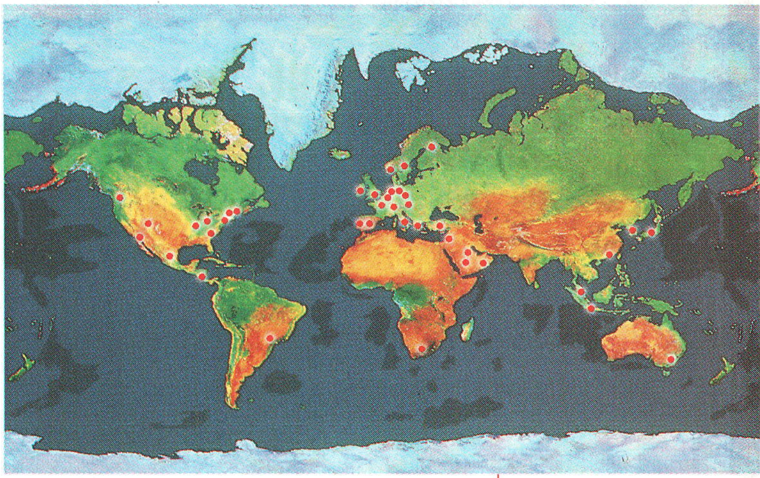
New frontiers of technology are constantly being explored, with every idea and development supported by the strength of Kyocera Corporation, one of Japan's and the world's most respected manufacturing businesses.

Within the IT sector, Kyocera page printer products are distributed throughout the globe via a network of subsidiaries. The business of Kyocera Electronics is represented in Europe by Kyocera Electronics Europe (KEE). The Export Division currently serves a total of 26 countries in Europe, the Middle East and South Africa, while each of the largest subsidiaries (Germany, France and the UK) has its own Kyocera operation reporting to KEE. Selected distributors have been appointed by the Export Division for each country to serve that country's businesses.

Cut the cost of printing

Cost of ownership has been highlighted as a major factor in the decision-making process for purchases. There is a growing realisation that, although competitiveness in printer purchase price is an important issue in the decision-making process for printer purchases, more emphasis is being placed on the cost of consumables and the longer term economies and efficiencies of printers. The question being asked by professional buyers is: "How much will this cost my business in total?"

Two independent, UK-based organisations, Context and Pira International, have carried out extensive, exhaustive and detailed comparative tests on cartridge-free Kyocera printers, and these have proved the tremendous savings in cost of ownership of the Ecosys range, compared to competitors.



Kyocera's global investment - manufacturing and operating worldwide

Ecology is a vital issue

In developing the Ecosys range, Kyocera has recognised the need, not only for industry standard compliance, but also for vastly improved economies within the office, and the growing awareness of the need to protect the environment for generations to come.

BIS Strategic Decisions, the worldwide independent research company, has stated that this year alone in Europe, about 13 million non-biodegradable laser printer cartridges will be deposited as waste, each with tens of other

The new Kyocera FS-400, the compact desk top printer in the Ecosys range.

"... a global corporation that contributes to the world's prosperity, and places high value on the environment, taking steps to preserve it."

The FS-3600, the most powerful high speed page printer in the Ecosys range.

components inside the cartridge. Not only is this harmful to the environment, it is also a tremendous and unnecessary waste.

The Ecosys long-life drum is actually built into the printer's body, rather than inside a disposable cartridge, and is as hard as sapphire. Most Ecosys printer drums have a lifetime of 300,000 pages, compared with the average life expectancy of a conventional drum of between 5,000 and 10,000 pages. All this is achieved with no reduction in print quality, whether the user requires 4, 10 or 18 pages per minute. All printers also feature Energy Star compliance for saving power and draft print mode for saving toner.

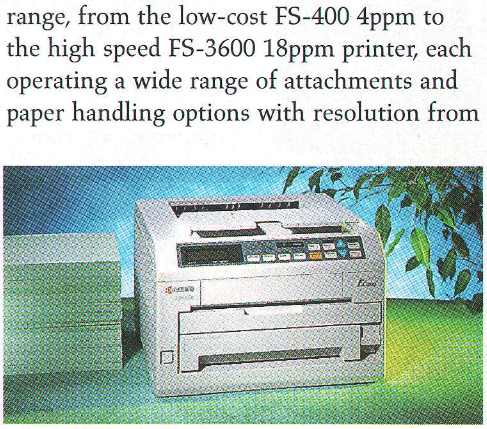
Outstanding connectivity and modularity

Ecosys printers have exceptional connectivity options; they will operate with almost all computers and networks. A special network interface functions with a choice of Network Interface Cards in both multi-protocol and Novell versions, and every major operating system is supported. Just about any special requirement can be handled.

Another waste-saving feature is the modular design. A whole family of attachments - double-sided printing, sorter/mailbox, up to 2,000 sheet feeder and output stacker and so on - are able to be added as required, and can be interchanged with the various models.

There are five models in the Ecosys range, from the low-cost FS-400 4ppm to the high speed FS-3600 18ppm printer, each operating a wide range of attachments and paper handling options with resolution from 300dpi to 600dpi. There is also a powerful production printer for high volume and special media printing where, for instance, bar codes and labelling are among the facilities required.

Kyocera has established an industry standard in terms of economy. This has been combined with an ecological philosophy that not only includes cartridge-free operation, but also low power usage, virtually no-ozone emissions, long-life components and biodegradable toner kits. It is a true marriage of economy, ecology and system potential, termed by Kyocera as the Ecosys range.



For more information about the Kyocera range of Ecosys printers, call, fax or write to:

Kyocera Electronics Europe GmbH
Export Division
Mollsfeld 12, 40670 Meerbusch, Germany
Telephone: +-49-2159-9180
Fax: +-49-2159-918108

KYOCERA

Steve Jobs *Steve Wozniak* *Mitch Kapor*

We Owe it All To the Hippies

Forget antiwar protests, Woodstock, even long hair. The real legacy of the sixties generation is the computer revolution

By STEWART BRAND

NEWCOMERS TO THE INTERNET are often startled to discover themselves not so much in some soulless colony of technocrats as in a kind of cultural Brigadoon—a flowering remnant of the '60s, when hippie communalism and libertarian politics formed the roots of the modern cyberrevolution. At the time, it all seemed dangerously anarchic (and still does to many), but the counterculture's scorn for centralized authority provided the philosophical foundations of not only the leaderless Internet but also the entire personal-computer revolution.

We—the generation of the '60s—were inspired by the "bards and hot-gospellers of technology," as business historian Peter Drucker described media maven Marshall McLuhan and technophile Buckminster Fuller. And we bought enthusiastically into the exotic technologies of the day, such as Fuller's geodesic domes and psychoactive drugs like LSD. We learned from them, but ultimately they turned out to be blind alleys. Most of our generation scorned computers as the embodiment of centralized

COMPUTER-ALTERED PHOTOGRAPHS: CLOUDS: IVAR MJELL—FPG; LEFT AND CENTER: ROBERT FOOTHARAP; RIGHT: RICK FRIEDMAN—BLACK STAR

Nicholas Negroponte

Bill Gates

COMPUTER-ALTERED PHOTOGRAPHS: ANNE CONWAY—NEW SCIENTIST; PHILIP AMDAL

control. But a tiny contingent—later called "hackers"—embraced computers and set about transforming them into tools of liberation. That turned out to be the true royal road to the future.

"Ask not what your country can do for you. Do it yourself," we said, happily perverting J.F.K.'s Inaugural exhortation. Our ethic of self-reliance came partly from science fiction. We all read Robert Heinlein's epic *Stranger in a Strange Land* as well as his libertarian screed-novel, *The Moon Is a Harsh Mistress*. Hippies and nerds alike reveled in Heinlein's contempt for centralized authority. To this day, computer scientists and technicians are almost universally science-fiction fans. And ever since the 1950s, for reasons that are unclear to me, science fiction has been almost universally libertarian in outlook.

As Steven Levy chronicled in his 1984 book, *Hackers: Heroes of the Computer Revolution*, there were three generations of youthful computer programmers who deliberately led the rest of civilization away from centralized mainframe computers and their predominant sponsor, IBM. "The Hacker Ethic," articulated by Levy, offered a distinctly countercultural set of tenets. Among them:

"Access to computers should be unlimited and total."

"All information should be free."

"Mistrust authority—promote decentralization."

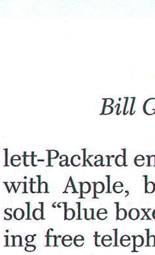
"You can create art and beauty on a computer."

"Computers can change your life for the better."

Nobody had written these down in manifestoes before; it was just the way hackers behaved and talked while shaping the leading edge of computer technology.

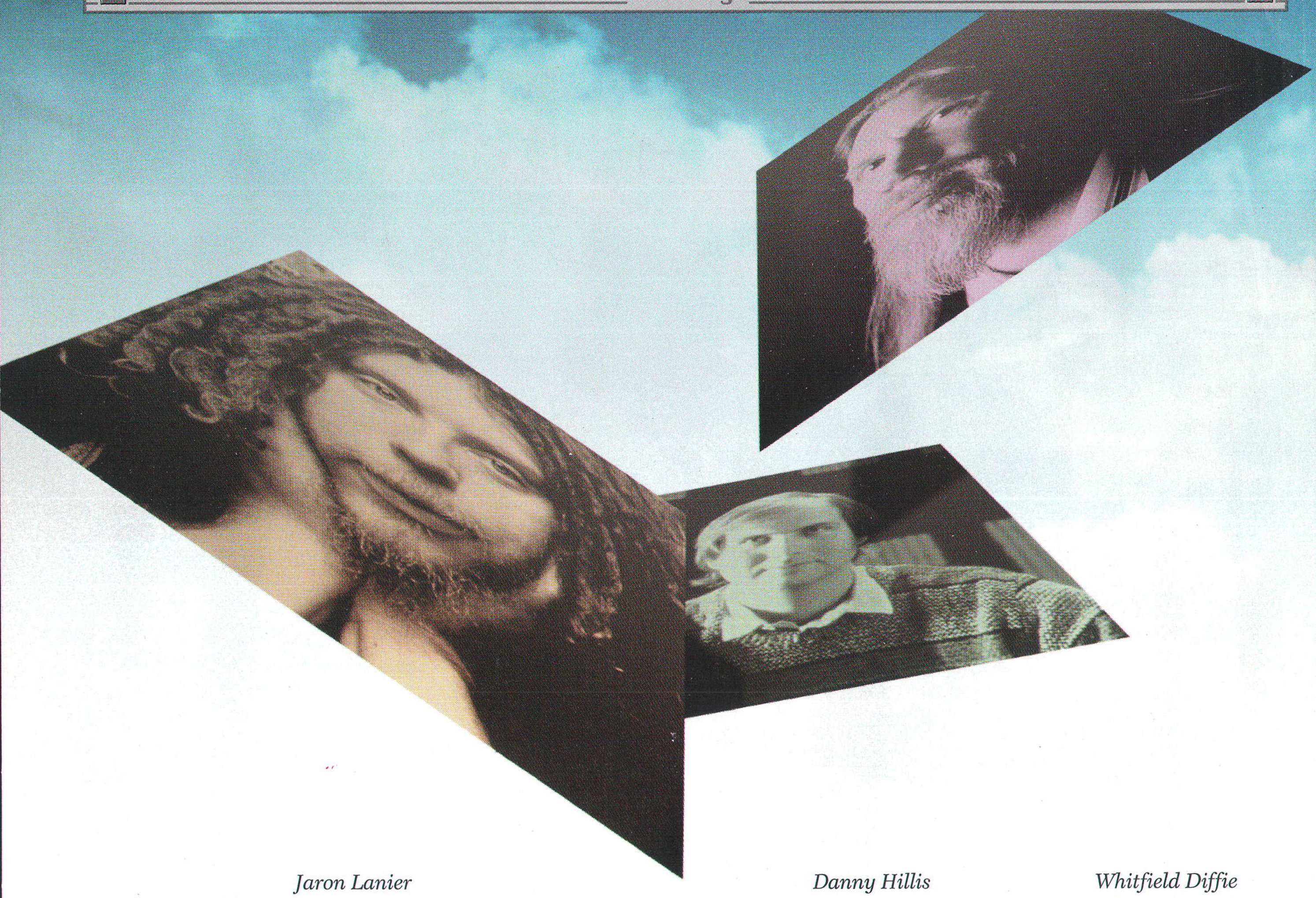
In the 1960s and early '70s, the first generation of hackers emerged in university computer-science departments. They transformed mainframes into virtual personal computers, using a technique called time sharing that provided widespread access to computers. Then in the late '70s, the second generation invented and manufactured the personal computer. These nonacademic hackers were hard-core counterculture types—like Steve Jobs, a Beatle-haired hippie who had dropped out of Reed College, and Steve Wozniak, a Hewlett-Packard engineer. Before their success with Apple, both Steves developed and sold "blue boxes," outlaw devices for making free telephone calls. Their contemporary and early collaborator, Lee Felsenstein, who designed the first portable computer, known as the Osborne 1, was a New Left radical who wrote for the renowned underground paper the Berkeley *Barb*.

As they followed the mantra "Turn on, tune in and drop out," college students of the '60s also dropped academia's traditional disdain for business. "Do your own thing" easily translated into "Start your own business." Reviled by the broader social establishment, hippies found ready acceptance in the world of small business. They brought an honesty



MARK RICHARDS—DOT FOR TIME

Stewart Brand, 56, created the Whole Earth Catalog *and co-founded the Hackers Conference and the* WELL *teleconference system. His most recent book is* How Buildings Learn.



Jaron Lanier *Danny Hillis* *Whitfield Diffie*

COMPUTER-ALTERED PHOTOGRAPHS: CLOUDS: IVAN MJELL—PFG; LEFT: GEORGE STEINMETZ; CENTER: RICHARD SOBOL—SIPA; RIGHT: JEFFREY NEWBURY—OUTLINE

Reviled by the Establishment, hippies were embraced by the world of small business

and a dedication to service that was attractive to vendors and customers alike. Success in business made them disinclined to "grow out of" their countercultural values, and it made a number of them wealthy and powerful at a young age.

The third generation of revolutionaries, the software hackers of the early '80s, created the application, education and entertainment programs for personal computers. Typical was Mitch Kapor, a former transcendental-meditation teacher, who gave us the spreadsheet program Lotus 1-2-3, which ensured the success of IBM's Apple-imitating PC. Like most computer pioneers, Kapor is still active. His Electronic Frontier Foundation, which he co-founded with a lyricist for the Grateful Dead, lobbies successfully in Washington for civil rights in cyberspace.

In the years since Levy's book, a fourth generation of revolutionaries has come to power. Still abiding by the Hacker Ethic, these tens of thousands of netheads have created myriad computer bulletin boards and a nonhierarchical linking system called Usenet. At the same time, they have transformed the U.S. Defense Department–sponsored ARPAnet into what has become the global digital epidemic known as the Internet. The average age of today's Internet users, who number in the tens of millions, is about 30 years. Just as personal computers transformed the '80s, this latest generation knows that the Net is going to transform the '90s. With the same ethic that has guided previous generations, today's users are leading the way with tools created initially as "freeware" or "shareware," available to anyone who wants them.

Of course, not everyone on the electronic frontier identifies with the countercultural roots of the '60s. One would hardly call Nicholas Negroponte, the patrician head of the Massachusetts Institute of Technology's Media Lab, or Microsoft magnate Bill Gates "hippies." Yet creative forces continue to emanate from that period. Virtual reality—computerized sensory immersion—was named, largely inspired and partly equipped by Jaron Lanier, who grew up under a geodesic dome in New Mexico, once played clarinet in the New York City subway and still sports dreadlocks halfway down his back. The latest generation of supercomputers, utilizing massive parallel processing, was invented, developed and manufactured by Danny Hillis, a genial longhair who set out to build "a machine that could be proud of us." Public-key encryption, which can ensure unbreakable privacy for anyone, is the brainchild of Whitfield Diffie, a lifelong peacenik and privacy advocate who declared in a recent interview, "I have always believed the thesis that one's politics and the character of one's intellectual work are inseparable."

Our generation proved in cyberspace that where self-reliance leads, resilience follows, and where generosity leads, prosperity follows. If that dynamic continues, and everything so far suggests that it will, then the information age will bear the distinctive mark of the countercultural '60s well into the new millennium. ■

I began to acquire software: bigger word processors, faster spreadsheets, better-looking data bases! Then came the games ...

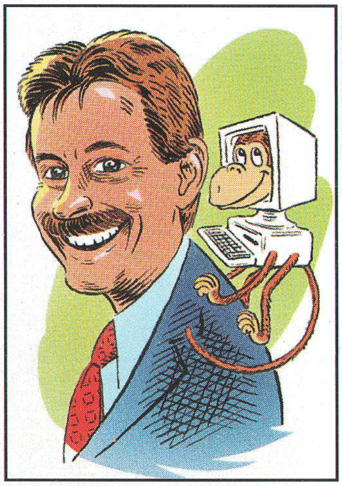
Confessions Of a Cyberholic

By TOM MANDEL

IT BEGAN INNOCENTLY ENOUGH: I was stuck at home, recovering from back surgery, and needed some diversion. Bored with channel surfing and unable yet to return to running, I borrowed a PC from the office, hooked up a modem and began to check out the local computer bulletin board (BBS) scene.

That was in 1985. When I finally came to my senses, the Berlin Wall had fallen and the Democrats were back in the White House, while I had just bought my fourth home computer and had spent thousands more on new software. My boss was demanding my long-overdue big report about the future of electronic media. I had run out of excuses. “More research,” I kept saying, “I gotta do more research on the net.” He shook his head and sent me to see the company shrink.

At first, the net had seemed so exotic and cutting edge. But I quickly worked my way through the list of local BBSes. Brief stops at nearby fantasy-game systems, electronic porn parlors and digital meet-a-date services proved tiresome. A few weeks of arguing with cyberfeminists in *alt.soc.women* on Usenet taught me that all was not fun and games. Then I found the WELL, acronym for Whole Earth ’Lectronic Link. “Hello,” I typed in. “I’m new around here and don’t know what to do next.”


ROBERT GROSSMAN FOR TIME

The gang on the WELL welcomed me with open arms. I was soon “talking” to people all over California and beyond about important issues of the day—like the latest technology or how the 49ers football team was doing. As a reward for my enthusiasm, the powers that ran the WELL asked me to run my own conferences and gave me a free account. At least it seemed free at first. The real, hidden costs—professional, financial, physical and emotional—were only just beginning to mount.

I began to take my new life very seriously. I took sides in the religious wars over the differences between PCs and Macs. I expressed opinions about everything. I even started an altercation that dragged half of West Coast cyberspace into an electronic brawl and got myself banished from the WELL. (They let me back two months later.) I moved on to the big commercial services: CompuServe, Prodigy, GEnie, Delphi and America Online, as well as half a dozen Internet systems. I had more user IDs (electronic addresses) than I sometimes had dollars in my bank account.

Not content merely to be wired, I began to acquire software: bigger word processors, faster spreadsheets, better-looking data bases! Then came the games—simulation games, adventure games, games of skill and luck, games that made my wrists ache. Soon I found that my hardware was inadequate: my microprocessor was too slow; I kept running out of memory; my screen was too small.

I probably should have recognized the first signs of cyberaddiction. My phone bill edged over $100 a month and then kept going up. Occasionally one of the services would cut me off for nonpayment—because I wasn’t off-line enough to open the bills. My work and financial records moved to a corner of the living room as I reassigned home-office space; after all, a brand-new 386-model PC, color monitor, fast dot-matrix printer and 2400 bps modem deserved their own desk and room. Visits to local computer supermarkets became more frequent than trips to neighborhood bookstores. Relatives and friends complained about busy signals and demanded that I get home voice-mail service.

I missed even the obvious idiosyncrasies. Visiting and posting frequently in Internet newsgroups about exercise equipment are not the same as exercising. Playing Tetris was not what my doctor had prescribed for my carpal-tunnel syndrome. Discussing lingerie via my online service’s “chat” utility was not a good substitute for a Friday-night date. (My last serious girlfriend mentioned something about that, but I lost her E-mail address.)

Like most abusers, I had to hit bottom before I saw what was going on. For that I have to thank some very good friends who showed me there is life without computers. And then, of course, there was that long power outage during last January’s big storm that forced me to go cold turkey. Now that I’ve faced the problem, I can speak without logging on, write without powering up and draw without a mouse. I recognize the normality of sunrise and sunset, and I have a real life.

Looking back, I find it hard to imagine a computer’s causing all that trouble. For those who are not yet acquainted with the addictive power of technology, this may seem just an amusing, if eccentric, tale. But others may find it all too familiar. If you need help, you can send me E-mail; I’m sure I won’t be that far away from cyberspace. I still have to finish tuning up my brand-new Pentium 90 speedster with the 2-gigabyte SCSI drive, 32 megs of screaming RAM, a 16.7 million-color screen, 4x CD-ROM drive, V.34 superdata highway modem. But before taking it out for a spin . . . ■

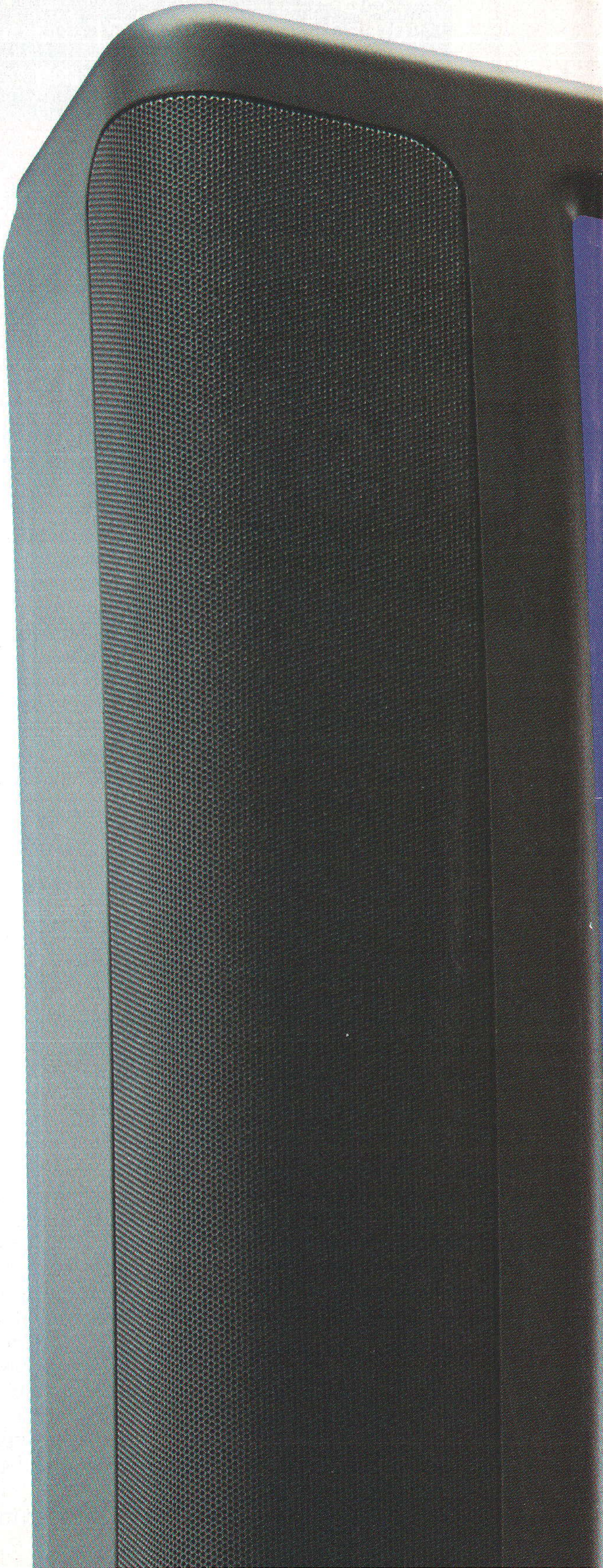
Tom Mandel, who was a professional futurist and management consultant with SRI International, died on April 5, 1995.

Welcome Intellig

When Technology Becomes Easy and Enjoyable. At Nokia, we use our expertise in the converging technologies of telecommunications and consumer electronics to make products easy to use. We are recognized for combining cutting-edge technologies with friendly user-interfaces in our TV and satellite receivers as well as our

digital base stations and GSM mobile phones. Our monitors win many awards, including an Innovation Prize for multimedia Mediastation at CeBit '95 and PC Magazine's Monitor of the Year '94. Nokia's GSM phone and PCMCIA cellular data card make the mobile office a reality. In each case, our aim has been to create "intelligent" products. By "intelligent" we mean the power to go quickly beyond learning how to use a product to enjoying it. As we pioneer technologies across the multimedia spectrum from transmission to reception, the same intelligence will be in all our products, so that the benefits of the digital age can be enjoyed by everyone.

NOKIA
CONNECTING PEOPLE



ent Television.

DELACROIX CONSULTING

Extra! Readers Talk Back!

By DAVID S. JACKSON/SAN FRANCISCO

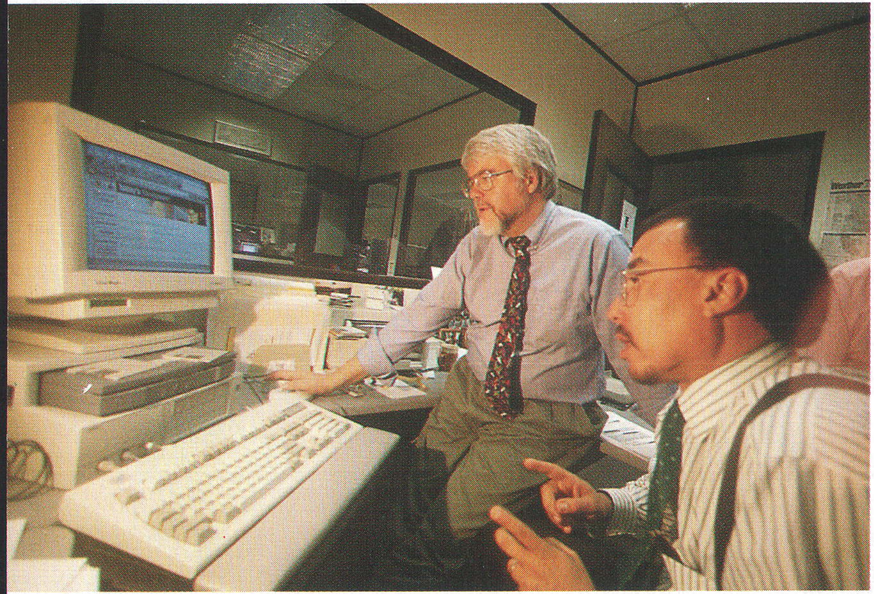
Journalists and their audiences are learning that the I-way is a two-way street

FOR MEDIA MOGULS, CYBERLAND HAS BECOME THE new Klondike. Hardly a week goes by without at least one new newspaper or magazine or television network pushing its stake into the ground and raising an ONLINE banner over the home office. More and more publications seem to feel that if you don't have a claim staked out on the virtual newsstand—either on existing information services like CompuServe or Prodigy or with your own Website directly on the Internet—you're nowhere. By the end of 1994, more than 450 publications had embraced the electronic option. CompuServe alone is host to upwards of 200 magazines and 55 newspapers, from *Ebony* to the Washington *Post.*

For most of these publications, the motive is strictly commercial. Publishers—sometimes with little or no consultation with their editorial counterparts—just set up shop and dump the contents of their titles into a file and send it off. The entry fee is relatively low: setting up a site on the World Wide Web can cost as little as $5,000—a pittance compared with the cost of a printing plant. In addition, existing online services pay publications for the right to post their journalists' prepaid contents, and some publications charge for access directly. Many online users are happy to surf through these services, checking out specs in *Road & Track* or downloading photos of models from *Elle.*

But the most successful newcomers to Cyberland are the ones that go well beyond mere postings of content and make their journalists an integral part of the enterprise. By offering message boards and forums, as well as by posting the E-mail addresses of reporters and editors, many publications (TIME among them) have started an electronic dialogue between journalists and their audiences that is having a subtle but important effect on both—and, inevitably, on the whole profession of journalism.

Suddenly reporters, their sources and their readers find themselves all together in a new environment, in which the much criticized power and distance of the press looks entirely different. Jennifer Wolff, writing last fall in the *Columbia Journalism Review,* refers to the new meeting place of press and public as an "unusual symbiosis." In it, she says, "readers have unprecedented access to reporters and editors, and journalists enjoy the rare opportunity to learn with lightning speed what their audience is thinking on a variety of issues."



MARK RICHARDS—DOT FOR TIME

Bill Mitchell, center, the paper's electronic editor, and publisher Jay Harris of the San Jose *Mercury News* are now veterans of online journalism

Gary Richards, who covers the transportation beat for the San Jose *Mercury News,* recently discovered just how this works. He got a tip-off from the message boards of America Online about state changes in rules governing the use of car-pool lanes. He quickly fired off an E-mail message to a government official to pin down the facts, and the resulting story made the front page (as well as the top of the *Merc's* online news service on AOL). Then Richards went back online to field more than a dozen messages from readers, including one that prompted a follow-up story. "There's a lot of good stuff out there," he says. "You just have to have the patience to weed through it."

The vast labyrinths of computer data bases do indeed offer a lot of potential source material to weed through. Reporters now regularly troll the Internet for stories in the same way they used to prowl the corridors of City Hall. The tradecraft is a little different, but journalists are learning fast. Last October more than 300 of them turned out for a four-day seminar on "computer-assisted reporting" in Santa Clara, California, where they were told how to use a computer to research everything from medical data bases to campaign contributions. A similar seminar on the East Coast was an even bigger draw.

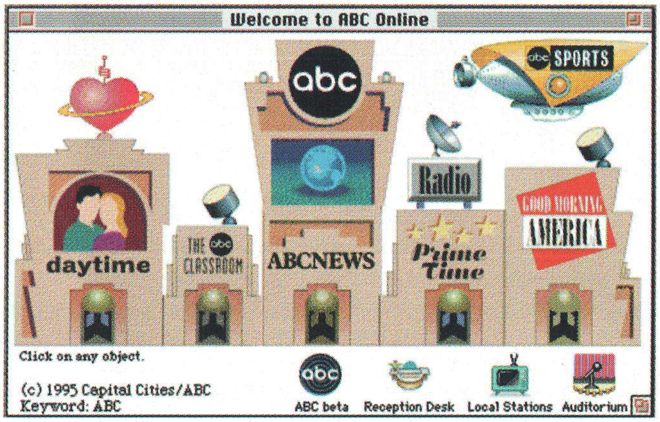
SOME NEWSPAPERS, INCLUDING THE RALEIGH (NORTH CAROLINA) *News & Observer*, give their reporters free Internet accounts and encourage them to use them. "It's a great tool," says *News & Observer* reporter Kay McFadden, who has broken several stories about IBM thanks to E-mail tipsters inside the normally tight-lipped corporation. "E-mail," she says, "allows you to virtually walk the corridors of IBM." In Atlanta, *Journal-Constitution* reporter Carrie Teegardin routinely logs onto a data base at the University of Michigan to collect census data for her stories on demographics. "It can be frustrating to navigate because there's so much in there," she says, "but it's immensely helpful."

It can also be hazardous. Adam Bauman, a reporter for the Los Angeles *Times,* thought he had written a pretty good story about how a government-funded computer at one of the U.S.'s nuclear weapons labs had been used to store more than 1,000 pornographic images on the Internet. When he later logged onto the WELL bulletin-board service, he found he'd been flamed to a crisp. "Misleading," complained one member. "Excrement!" cried another. He got so much electronic hate mail that he had to turn off his mailbox. "The impression I got was, 'We don't want snoopy reporters in here. This is our playground, and you're not welcome,' " Bauman said later.

Bauman was hardly the first journalist to get beaten up in cyberspace. Every reporter who ventures there soon learns how prickly its inhabitants can be about stories that reinforce the stereotype of the Net as a place where only spies, hackers and child molesters live. Editors are also discovering that the information highway is a two-way street: no matter what they print about gun control, for example, a flood of angry E-mail is almost sure to follow. While few editors will admit to being influenced by such online pressure (unless, of course, it points out an error), most journalists are likely to take the complaints into account in future stories—and there's nothing wrong with that.

A healthy dialogue with readers can be productive, but it also tests some of the rules and conventions of the Net. Though the context of most bulletin-board exchanges is closer to that of a cocktail party than it is to a press conference, prudent journalists must assume that their E-mail postings carry the same legal risks as print or broadcast information. But the law in cyberspace is still being written.

In most ways, however, reporters are finding online reporting not all that different from the old-fashioned kind. Many are even heartened by the belief that the growing glut of information in the digital age will make their job of sifting, analyzing and editing the news even more valuable. Says Bill Mitchell, electronic publishing director of the San Jose *Mercury News:* "There has been no technological development that will threaten a careful, enterprising and accurate reporter." But there are plenty of wired observers out there ready to pounce on a sloppy sentence or a mushy thought and hold a journalist's feet to the fire—and there's nothing wrong with that either. ■



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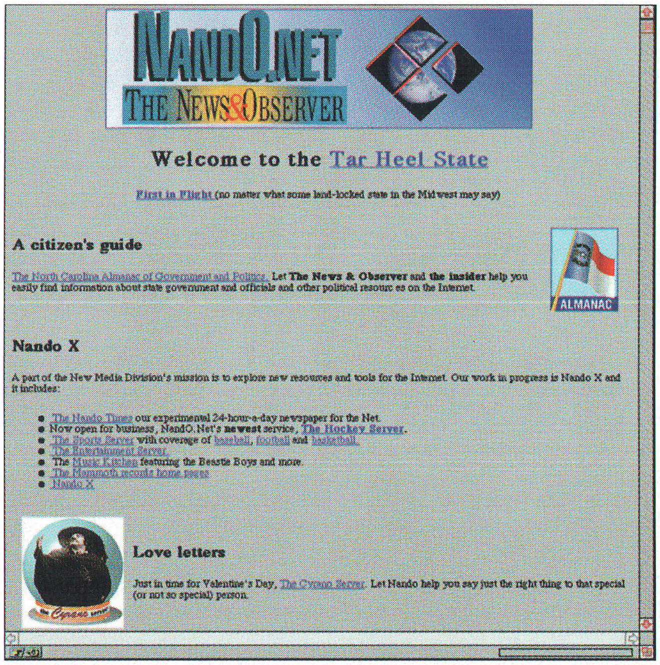


Welcome to the Tar Heel State

First in Flight (no matter what some land-locked state in the Midwest may say)

A citizen's guide

The North Carolina Almanac of Government and Politics. Let **The News & Observer** and **the insider** help you easily find information about state government and officials and other political resources on the Internet.

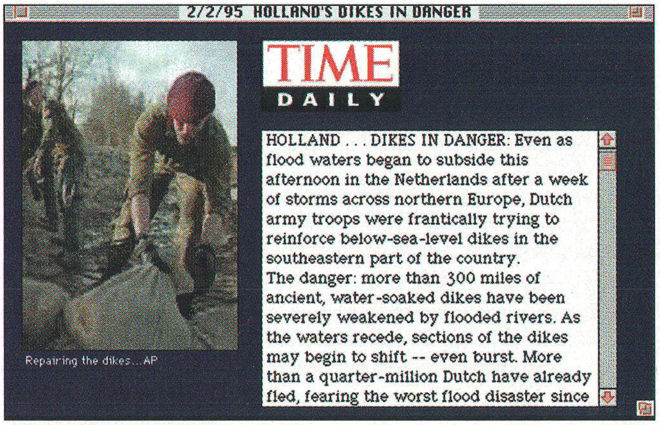
Nando X

A part of the New Media Division's mission is to explore new resources and tools for the Internet. Our work in progress is Nando X and it includes:

- The Nando Times our experimental 24-hour-a-day newspaper for the Net.
- Now open for business, NandO.Net's **newest** service, **The Hockey Server**.
- The Sports Server with coverage of baseball, football and basketball.
- The Entertainment Server.
- The Music Kitchen featuring the Beastie Boys and more.
- The Mammoth records home pages
- Nando X

Love letters

Just in time for Valentine's Day, The Cyrano Server. Let Nando help you say just the right thing to that special (or not so special) person.



HOLLAND . . . DIKES IN DANGER: Even as flood waters began to subside this afternoon in the Netherlands after a week of storms across northern Europe, Dutch army troops were frantically trying to reinforce below-sea-level dikes in the southeastern part of the country.
The danger: more than 300 miles of ancient, water-soaked dikes have been severely weakened by flooded rivers. As the waters recede, sections of the dikes may begin to shift -- even burst. More than a quarter-million Dutch have already fled, fearing the worst flood disaster since

ABC Network, top, and TIME magazine's Daily, bottom, vie for attention on America Online's crowded digital newsstand, while the Raleigh (North Carolina) *News & Observer* stakes a claim on the vast Internet with its NandO home page

Cops on The I-Way

Computer **crimes** are becoming more daring and **imaginative**

By MIKE GODWIN

HERE'S THE PLOT: SHORT OF cash but endowed with a wealth of computer skills, a clever employee is able to reach inside the boss's private data base and "kidnap" invaluable company secrets by locking them with a sophisticated encryption program. She then sends an anonymous electronic ransom note demanding a wire transfer of $3 million to a blind account in the Cayman Islands—or the boss's proprietary data will be lost forever.

Extortion—in this case hypothetical—is only one of the many imaginative, daring and increasingly publicized crimes that have gone high tech in recent years. In addition to the predictable tax, insurance and credit-card scams, software infringements and eavesdropping, the computer is now the site of crimes that range all the way up to homicide. "Law enforcement is becoming aware that computers can be used to facilitate just about any type of crime," says Jack King, legal editor of the *Bureau of National Affairs Criminal Practice Manual.*

One of the most emotion-raising illegal activities is the occasional use of the Internet and online services by pedophiles, who can use them to transmit child-pornography images and also to make assignations with youngsters. As for homicide, while it's hard to imagine that someone could be killed online, police in a Pennsylvania murder-kidnapping case found critical evidence, including a ransom note, on the defendant's computer. The computer can also be a tempting conduit for anonymous threats; the U.S. Secret Service tracked down one perpetrator who sent a threat to President Clinton's well-known E-mail address.

Computer crimes are hardly new. In California prosecutors have been pursuing high-tech crime in Silicon Valley for a couple of decades. But the focus and nature of the crimes have changed dramatically. When the U.S. Department of Justice set up a computer-crimes unit in September 1991, it was intended to cope primarily with threats to computer security posed by hackers, toll-fraud artists and electronic intruders. But the new crimes, says Jim Thomas, a criminology professor at Northern Illinois University, "aren't simply the esoteric type they were five years ago." They are "computer crimes," he adds, "only in the sense that a bank robbery with a getaway car is an 'automobile crime.'" And computers are fast approaching the ubiquity of automobiles.

JAY COLTON FOR TIME

Mike Godwin is online counsel for the Electronic Frontier Foundation. He has written for Whole Earth Review, Internet World, Wired *and* Playboy.

The ever richer variety of criminal activities has had law-enforcement officials scrambling—largely because neither the laws nor the enforcement structures were designed to deal with them effectively. A recent case that illustrated this was watched closely by just about everyone in the computer world. It was that of David LaMacchia, a Massachusetts Institute of Technology undergraduate who was charged last April with conspiring to distribute millions of dollars' worth of illegally copied commercial software over the Internet. LaMacchia allegedly set up and ran an online bulletin board that allowed anyone who accessed it to copy for free a variety of software programs. Touted as the largest single instance of software piracy ever uncovered, LaMacchia's case was thrown out last December by Massachusetts Federal Judge Richard Stearns, who decided that the senior from Rockville, Maryland, had in fact committed no crime at all. In January U.S. Attorney Donald Stern announced that he would not appeal the decision.

The Copyright Act, which covers software as well as tangible commodities like books, records, tapes and film, did not specifically criminalize LaMacchia's alleged conduct because he did not benefit from the venture. Instead, the feds chose to indict him on a charge of conspiracy to commit wire fraud. That was not a particularly good fit either, but government officials felt they had to charge him with *something.* "If the government did not respond when someone gave away a million dollars in software," says Scott Charney, who heads the U.S. Justice Department's computer-crimes unit, "we'd essentially be saying that you can give away software as much as you want."

Protecting the rights—in fact the livelihood—of commercial software makers is only one of many challenges facing authorities as they try to police cyberspace. Tricky legal issues abound, such as the admissibility of computer evidence. And law enforcers are often inadequately prepared for the tasks. As a result, more and more federal agents at the FBI Academy in Quantico, Virginia, and at the Federal Law Enforcement Training Center in Glynco, Georgia, are being trained to deal specifically with the complex issues involved in computer crime.

Shadowing every issue is the need to balance law enforcement with the constitutional rights of the burgeoning population of Internet users in the U.S. as they communicate in a universe without borders. One of the chief problems, for example, is how to write a search warrant for computer evidence. Warrants for physical evidence are relatively easy, but finding the "location" of computer evidence on a network—or on the Internet—can be downright metaphysical. Is the evidence really on *this* computer terminal, or is it being accessed from a hard disk in another state? In addition, searching a computer bulletin-board system with two gigabytes of data on it may require agents to spend weeks scanning through irrelevant material to find what they want. Last year Charney co-authored a set of federal guidelines for searching and seizing computers, designed to provide answers to some of these questions

Authorities in the U.S. are also concerned about the adequacy of current

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Police in a murder-kidnapping case found the ransom note on the defendant's computer.

COMPUTER-ALTERED PHOTO-ILLUSTRATION FOR TIME BY MATT MAHURRIN
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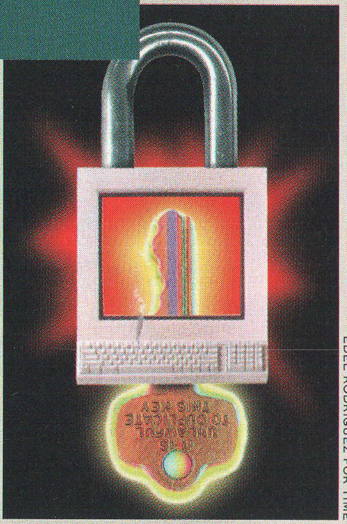
KEYS TO THE KINGDOM

To most private citizens of a certain age, encryption is a term of espionage, redolent of secretly coded messages sent by agents from behind enemy lines. In the modern world of computers, however, encryption—also known as "crypto"—has moved from the clandestine to the commonplace. The use of sophisticated codes and keys to protect the privacy of electronic exchanges has become the practical equivalent of sending messages by secret-agent courier. In the past year, moreover, encryption has become a code word in itself, representing a raging war that pits government against a broad coalition of private citizens eager to protect their right to privacy.

One recent development helped bring this battle to a head. Powerful encryption software has become remarkably cheap and accessible, enabling anyone with a home computer to encode messages so effectively that even the U.S. National Security Agency's supercomputers may not be able to read them. One favorite is Boulder, Colorado, programmer Phil Zimmerman's PGP, for Pretty Good Privacy, free to anyone in America who wants to download it from the Internet or from non-Internet-connected BBSs that carry it.


EDEL RODRIGUEZ FOR TIME

The proliferation of such programs has wrought panic among law-enforcement officials and their brethren in the military and intelligence communities, who see it as a serious threat to their ability to police computer crimes and espionage. The U.S. government is trying to suppress development of such unbreakable encryption on two fronts. It is promoting public use of its own approach to the technology, called "key-escrow encryption," which would allow the government to hold keys to any and all encrypted communications. Washington is also vigorously enforcing a ban on the export of encryption software, regardless of whether such software can thwart government operations from outside U.S. borders.

Privacy advocates say the public's need for encryption tools is greater than ever. "E-mail messages are just too easy to intercept and scan for keywords," Zimmerman told a congressional committee in 1993. Such surveillance, he warned, "can be done easily, routinely, automatically and undetectably on a grand scale." Other experts argue that the government's case is vastly overstated. "The number of crimes in which encryption is going to be used is infinitesimal," says criminologist Jim Thomas. Advocates on both sides of the debate argue with conviction that their view is in the best interests of a healthy democratic society. To be sure, safety and stability remain important components, but so too is privacy. Citizens who have watched as computers have made possible all manner of intrusion into their lives are likely to welcome a piece of technology that enables them to take some of that privacy back.

—M.G.

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laws in dealing with computer and network crime. While most states now have some kind of computer-crime laws, those laws often go uninvoked, largely because such crimes are still rare and prosecutors have little experience with them. To circumvent this problem, Massachusetts Governor William Weld recently signed into law a set of amendments that integrate computer crimes into existing criminal statutes.

Then there is the question of exactly what should qualify as a crime. The LaMacchia case, for example, illustrates a serious risk to system operators (sysops) on the Net: To what extent will they be held criminally responsible for the acts of their users? Computer networks, both public and private, have become an important forum for public discourse and activity. Laws that hold sysops responsible for their users' online actions might drive them to quit operating those forums altogether.

That outcome would be disastrous for the Internet, whose major appeal has been as a "digital space" where individuals and societies can explore freedom of expression and self-definition. That is why the fine line between legitimate deterrence and constitutionally protected speech is coming under increased scrutiny. "If you 'walk the beat' on the Internet too vigorously," says the U.S. Justice Department's Charney, "you have a chilling effect on First Amendment rights." Rather than patrol the Net themselves, cybercops increasingly urge citizens to contact the FBI or the Secret Service if they learn about crimes or threats.

Law-enforcement agencies, in turn, are using the Net to help solve crimes. The FBI, for example, has begun putting requests for information about lawbreakers on its Mosaic home page, the electronic equivalent of a WANTED poster. Late last year the agency posted details of the so-called Unabomber case, a series of 14 unsolved bombing incidents in the U.S. dating back to 1978—and offered a $1 million reward.

Constitutional rights aside, the government often feels pressure to put a lid on activities that are seen as antisocial—even when the laws don't directly address such conduct. In the LaMacchia case, civil libertarians were disturbed at what they saw as strong-arm tactics: an attempt to mold criminal law according to what the Justice Department wanted. Judge Stearns, in his decision to dismiss the case, suggested that it was up to Congress to amend the copyright laws if it wanted to encourage this sort of prosecution.

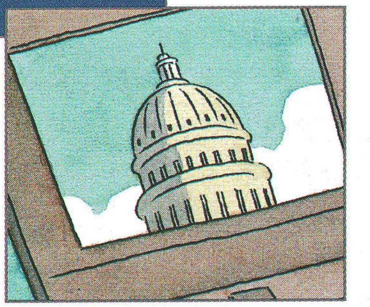
At the same time, the judge warned that interpreting the criminal law too broadly "would serve to criminalize the conduct of not only persons like LaMacchia, but also the myriad of home computer users who succumb to the temptation to copy even a single software program for private use." That, he said, was not something "that even the software industry would consider desirable."

Stearns' opinion outlines the balance of concerns that must guide any attempt to pursue law and order in cyberspace. This new jurisprudential battleground is littered with double-edged swords. While it is clearly important that the laws of this new realm be explicit and enforceable, it is even more vital that the legal system have enough perspective and flexibility to deal with a world that is changing at fiber-optic speeds. ■

Virtual Washington

The way is open for the total overhaul of U.S. politics

By KEVIN PHILLIPS

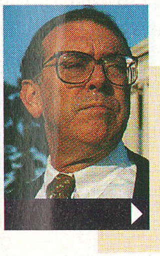


RAIN OR SHINE, FEW AMERICANS will go to the polls on Election Day in November 2020. Most will vote by modem, telephone or mail—and overall citizen participation will be much greater than it is today. So will citizen interest, partly because four or five reasonably serious presidential candidates will be on the ballot, along with at least one official referendum and perhaps half a dozen national advisory referendums. Enthusiasm for the democratic process will have reached a point where even Washington should be more popular.

Too hopeful? Perhaps. But it's no pipe dream. Technology, whose image has suffered under a century's worth of dictators, Orwellian novels and a long cold war, is becoming a key to the revitalization of U.S. politics. The 1990s are witnessing technology's re-emergence in the healthier role foreseen by Benjamin Franklin and Thomas Jefferson, as an enabler and propagator of democracy.

The stakes are enormous. The science needed to effect this revolutionary transition is at hand; it's the nation's psychology that lags. Americans are still exorcising political ghosts and brooding about runamuck populism through electronic plebiscites dominated by talk-show hosts and TV cartoons. But a gradual, successful infusion of new technology into 21st century politics should serve to build confidence among skeptics.

The mood of the nation is ripe. Last year survey takers reported that U.S. computer owners listed politics online as one of their highest priorities. And the newest political parties and movements often show a high-tech underpinning. Ross Perot's 1992 organizers, for example, drew their highest ratios of petition signers in high-tech strongholds—from Massachusetts' Route 128 across the nation to Silicon Valley and Silicon Prairie. Upbeat theorists are prognosticating a "virtual Washington" in which members of Congress can debate and vote from back home, and several Representatives have asked to be allowed to vote from their districts. Newt Gingrich, the first self-proclaimed futurist to become the Speaker of the House, is in the process of putting Capitol Hill online, allowing computer users to gain access to pending legislation through a new information system named "Thomas" after—who else?—Thomas Jefferson.



TERRY ASHE FOR TIME

Kevin Phillips is publisher of the American Political Report *and author, most recently, of* Arrogant Capital: Washington and the Frustration of American Politics.

History and political science suggest that voters are more discerning than the critics of "hyperdemocracy" (themselves often élites fearful of displacement) have been warning. "On most major issues we've dealt with in the past 50 years," pollster George Gallup Sr. noted in 1984, "the public was more likely to be right—based on the judgment of history—than the legislatures or Congress."

We should recall that between the Renaissance and the 19th century Industrial Revolution, new communications technology, from the printing press to the telegraph, generally spurred mass political participation. True, today's Pollyannas could end up looking as foolish as the doomsayers of that era once did—like Alfred Lord Tennyson, who gushed that the telegraph would result in "war banners furled" and a "parliament of the world." Yet it is really our own century that has turned from enthusiasm for the benefits of science to a kind of techno-pessimism: instead of advancing participatory democracy, early radio and then television actually buoyed the strength of central governments, authoritarian leaders and mass-merchandise hucksters.

From Hitler's mesmerizing Nuremberg rallies circa 1935 to direct mail in the 1970s to the trivializing eight-second sound bites that have marked recent campaigns, the techniques of this era have too often favored power seekers or clever interest-group mobilizers while discouraging ordinary voters and making them cynical. This distorted top-to-bottom information cascade must give way to a next stage of technology—one that will reverse the flow, thereby ending a half-century's buildup of lawyer-lobbyists who represented interest groups (including the media) more than they did voters.

Technology's new challenge, ideally at least, is to re-empower voters and revitalize democracy through more direct popular representation. Pitfalls do abound. The same technology able to identify and link citizens and political institutions will also necessarily facilitate nationwide identification systems and increased governmental surveillance. This will undoubtedly prompt a second neo-Orwellian howl to accompany an élitist shudder over entrusting the people—the booboisie as a 21st century cybermob. But overall, the favorable balance that should result is compelling.

Here are five critical circumstances and developments that we should all monitor carefully in the future:

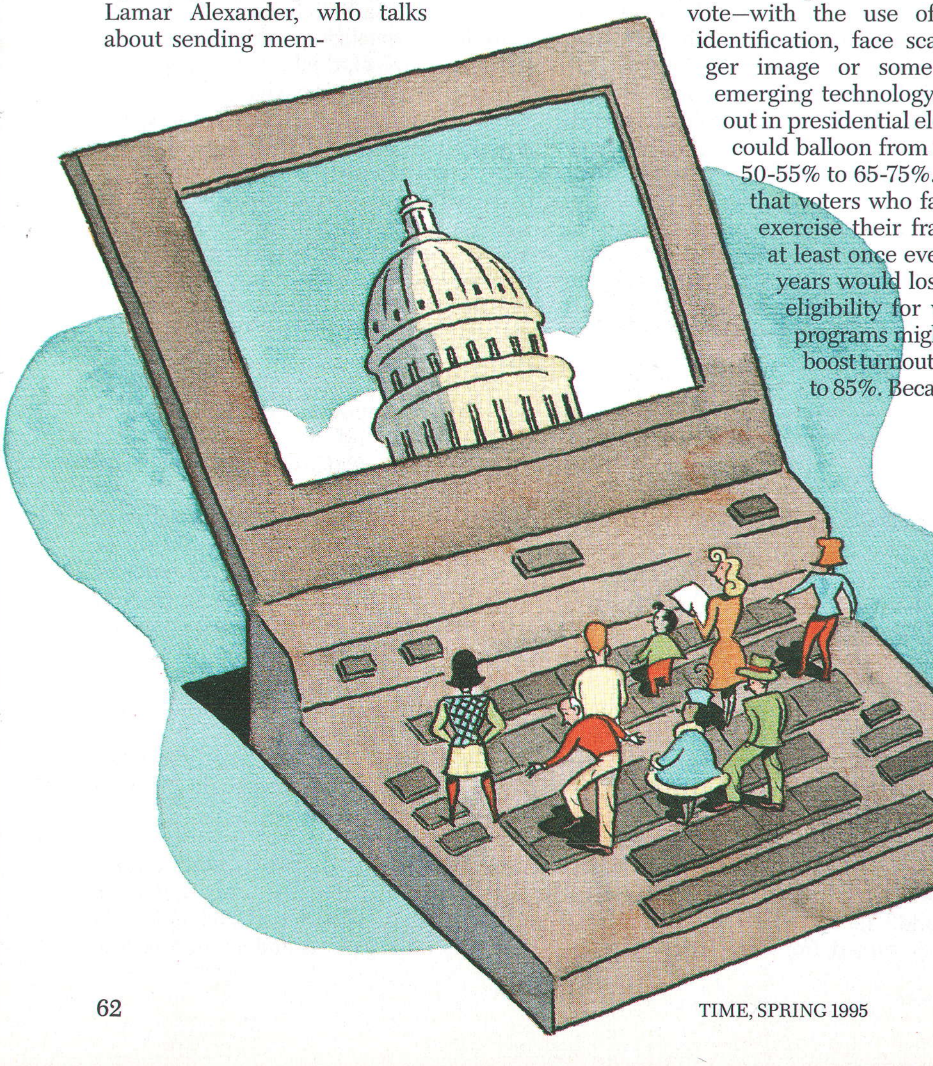
PUTTING POLITICS ONLINE North America has 19 million computer users online vs. 6,400,000 in all of Europe, 920,000 in Asia and 107,000 in Central and South America.

At some point four to six years hence, the U.S. will become a testing ground: the first nation where most organizations and large portions of the upper and middle classes have individual online capacity. Poorer citizens still won't, though, which is why Gingrich and others have raised legitimate questions about public access and even subsidies for acquiring personal computers. Americans can expect a partial redefinition of constitutional questions of civil rights, protected political speech, copyrights and the right to petition government.

CREATING VIRTUAL WASHINGTON Perot has already urged national town meetings, a group in Pennsylvania is talking about voters advising Washington via an electronic Congress, and nostalgia is growing for a high-tech update of Athenian democracy or of Norman Rockwellian townspeople gathered around a cast-iron stove in rural Vermont. Virtual Washington would be a wired, cyberspatial capital in which U.S. Representatives and Senators could participate from their states or districts, while citizens, too, would have any information, debate or proceeding at their fingertips. Republican presidential candidate Lamar Alexander, who talks about sending members of Congress home for six months of the year to be part-time citizen-legislators, assumes they can easily be hooked up to debate and vote in Washington. Experiments—for example, having one-third or even two-thirds of the full House of Representatives, or even just a congressional committee, taking part from Idaho or Wisconsin—are plausible. A prediction: by the year 2000, Congress will have conducted several such trials.

EXPANDING INDIVIDUAL VOTING Present-day experiments in voting by telephone or by touching a video screen (recently tested in Burton, Michigan) are only an early threshold. By the end of the century, the pressures of illegal immigration, urban breakdown, and fiscal and job crises afflicting America will converge with the capabilities of advanced technology to create a nationwide identification system (and possibly a national identity card). Presumably, any person of majority age with an official identification, which would include proof of citizenship, would be able to vote—with the use of voice identification, face scan, finger image or some other emerging technology. Turnout in presidential elections could balloon from today's 50-55% to 65-75%. A rule that voters who failed to exercise their franchise at least once every two years would lose their eligibility for various programs might even boost turnout to 75% to 85%. Because the political impact would be enormous, this could be a pivotal early–21st century national debate.

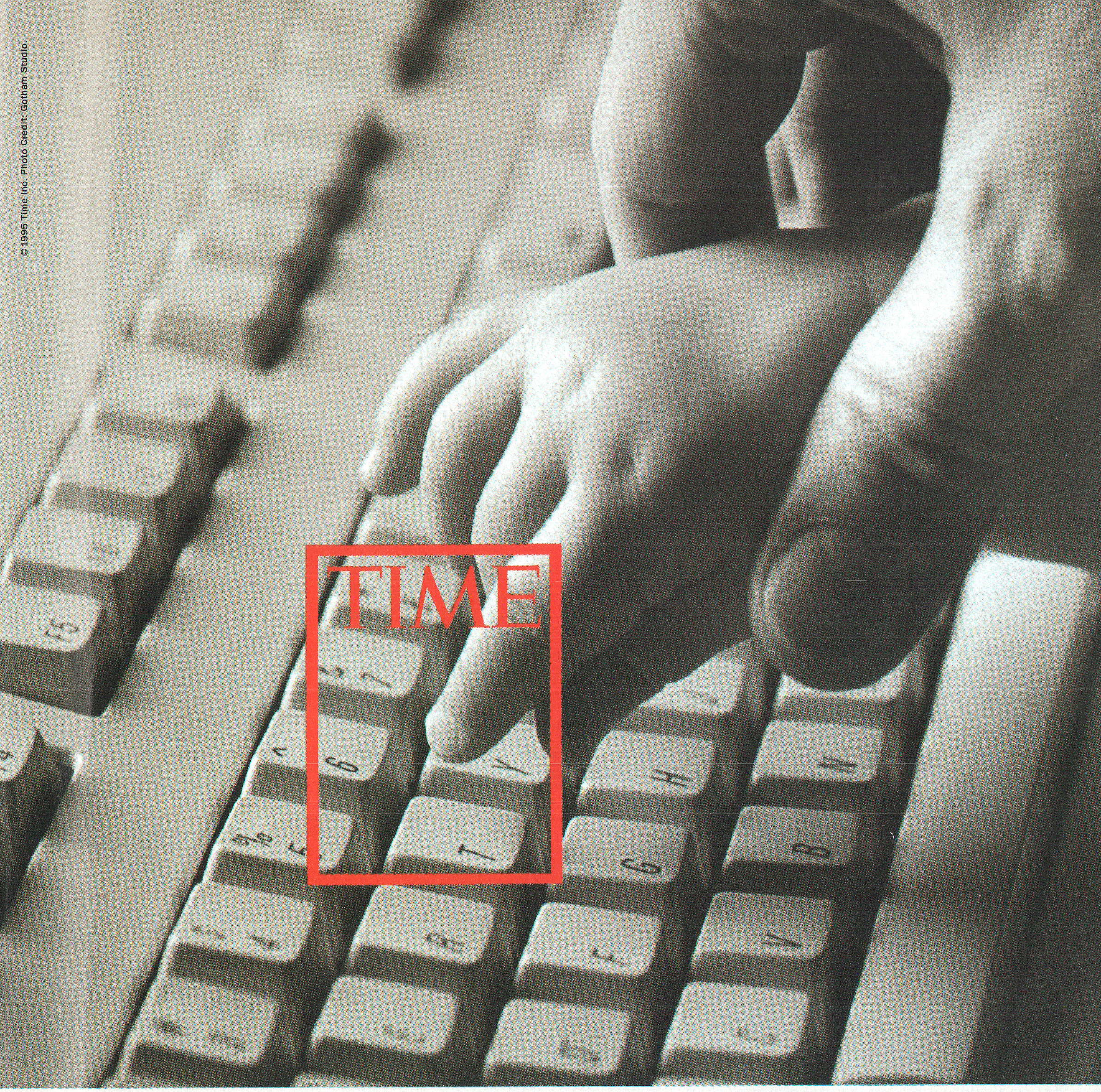
Some would like a high-tech version of Athenian democracy



CREATING NATIONAL REFERENDUMS In a TIME poll last September, Americans favored establishing a national referendum by an overwhelming 76% to 19%. Similar sentiments are visible in other English-speaking nations that also share America's history of representative rather than direct democracy. In 1992 Canadians voted on the status of Quebec, New Zealand recently balloted to switch legislative districts from winner-take-all to proportional representation, and Prime Minister John Major is discussing letting Britain have a nationwide vote on European monetary unification. Technology makes it so easy that by the year 2000, Americans will probably have a chance to vote on a similar, carefully limited group of major national issues. By 2020, success may well have enlarged the scope of citizen decision making.

INCREASING CHOICE OF PARTIES As technology gives Americans greater options in entertainment, media and shopping, pressures are rising for more say in politics. The choice between Republicans and Democrats, the two megaparties created 140 to 170 years ago in the Industrial Revolution, is increasingly unsatisfactory. Some 53% to 58% of Americans want a new third party and, as with participatory democracy, this additional consequence of dissatisfaction with the party system is also widespread in other English-speaking countries. The question for the next century is less whether the Republican-Democratic party system will weaken than how: more direct democracy, more parties or both? Interestingly, even if Americans must choose from among four or five presidential candidates on the 2020 ballot, technology will make it safe and easy. Voters can pick a first choice and then a second: if nobody gets a majority, the loser is dropped, and second-place votes are allocated. The fears abroad in 1968 and 1992 about nobody getting a majority in the Electoral College would be irrelevant. Tests last year in Cambridge, Massachusetts, showed that the computers could handle this in a wink.

Because this interaction with technology could change American politics so much, the cynic can fairly ask: Is it only 20 or 25 years away? The answer is: Maybe less. ■



©1995 Time Inc. Photo Credit: Gotham Studio.

You can understand computers now. Or wait for your children to explain them to you later.

Understanding comes with TIME.

© 1994 Time Inc. Photo Credit: Max-Planck-Institute for Astronomy. TIME Magazine, August 1, 1994.

For those without access to
the Hubble telescope, it
was the most detailed view.

Understanding comes with TIME.

Battle for Remote Control

By JOHN GREENWALD

America's corporate **giants** are wrestling for dominance in an emerging **$1 trillion** market

FOR MORE THAN A DECADE, ROBERT REDFORD'S SUNdance Film Festival has celebrated the latest trends in American independent filmmaking. It was thus a sign of the times that at this year's screenings, the talk was not only about actors, directors and hip new movies, but also about the information superhighway. Gathered in Park City, Utah, in January, the Beautiful People heard the experts talk about two-way media, explored online services and debated the merits of CD-ROM technology. "It's going to be like a geologic upheaval," Redford said. "We're going to have to sit and watch as the pirates of the high seas lock ships and duke it out."

Indeed we shall—and indeed we are, for the battle is already well under way. Seldom have the opportunities for riches seemed so great, or the risks of failure so daunting, as in today's rush to profit from the information revolution. It is a contest that goes beyond who will build and control two-way TV, toward a fundamental reshaping of the communications, information and entertainment industries.

There are technical issues aplenty, such as whether the computer or the television—or some hybrid—will be the main electronic link to the home of the 21st century. But the more tantalizing question is just how the information titans will make their money. Spurred by forecasts that the worldwide market for everything from movies on demand to electronic shopping malls could reach $1 trillion within a decade, top corporate strategists are still debating whether they will profit most by distributing digital data, by owning it or by some combination of the two.

"Many corporate and personal fortunes will be won—and lost," says Joseph Kraemer, who follows the communications and electronics industries for EDS Management Consulting Services in Washington. "The phrase bet the company will be used more often, and with more passion and much more accuracy, than at any other time since World War II."

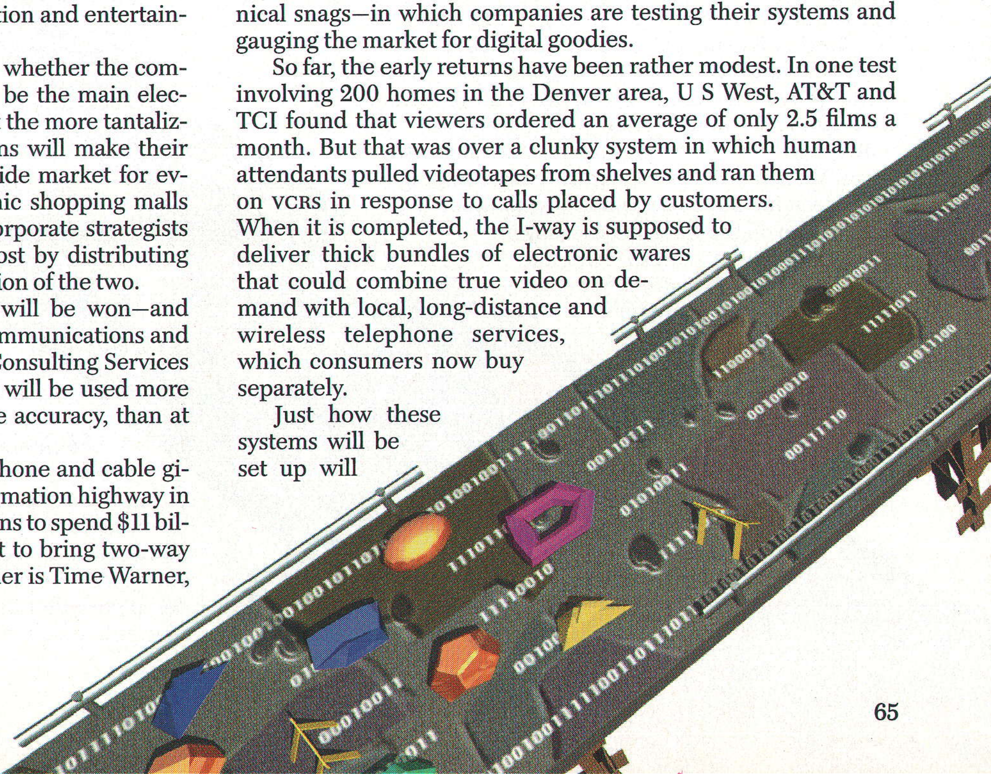
Chief among the combatants are the telephone and cable giants that are building rival versions of the information highway in the U.S. One of these is Bell Atlantic, which plans to spend $11 billion on fiber-optic cable and other equipment to bring two-way TV to 8 million homes by the year 2000. Another is Time Warner, which is neck and neck with TeleCommunications Inc. in the race to be America's largest cable company. Time Warner is teaming with U S West to test its notion of a state-of-the-art system in Orlando, Florida, as part of a $5 billion effort to build what the company calls its Full Service Network.

Also jockeying for position are innumerable hardware, software and electronics companies that provide the components for the information highway. They range from giants like Intel, Microsoft, AT&T and IBM to countless smaller companies, some of which may emerge as tomorrow's giants. Dozens of suppliers stand to rake in billions of dollars over the next five years as the telephone and cable companies construct their systems.

The outcome will not be immediate by any means. Completion of the elaborate rewiring project will not come before the turn of the century. Unlike the globe-circling Internet, the interactive interstate is still more concept than reality. It consists today of dozens of scattered trials—many of them plagued by technical snags—in which companies are testing their systems and gauging the market for digital goodies.

So far, the early returns have been rather modest. In one test involving 200 homes in the Denver area, U S West, AT&T and TCI found that viewers ordered an average of only 2.5 films a month. But that was over a clunky system in which human attendants pulled videotapes from shelves and ran them on VCRs in response to calls placed by customers. When it is completed, the I-way is supposed to deliver thick bundles of electronic wares that could combine true video on demand with local, long-distance and wireless telephone services, which consumers now buy separately.

Just how these systems will be set up will



No single company has the resources to build, maintain

be worked out not by any single player but by alliances of companies. Cooperation is a necessity, because no single company has the resources to build, program and operate anything as complex as an information highway. There are about half a dozen such confederations. In addition to the Time Warner/U S West/Silicon Graphics partnership, cable giants TCI, Cox and Comcast have joined forces with the long-distance company Sprint to develop a design of a seamless nationwide system for delivering cable and telephone service.

MEANWHILE, A NUMBER OF THE BABY BELL PHONE companies have turned to Hollywood. Ameritech, Bell South and Southwestern Bell (now SBC Communications) are teaming up with the Walt Disney Co. to develop and distribute movies, games and other programs to home viewers. Nynex, Bell Atlantic and Pacific Telesis have been talking with superagent Michael Ovitz about forming an alliance to make and distribute films. The idea is to create a coalition, or umbrella, that would enable the telephone companies, with the clout of their 50 million customers, to acquire the programming that will go out over these networks.

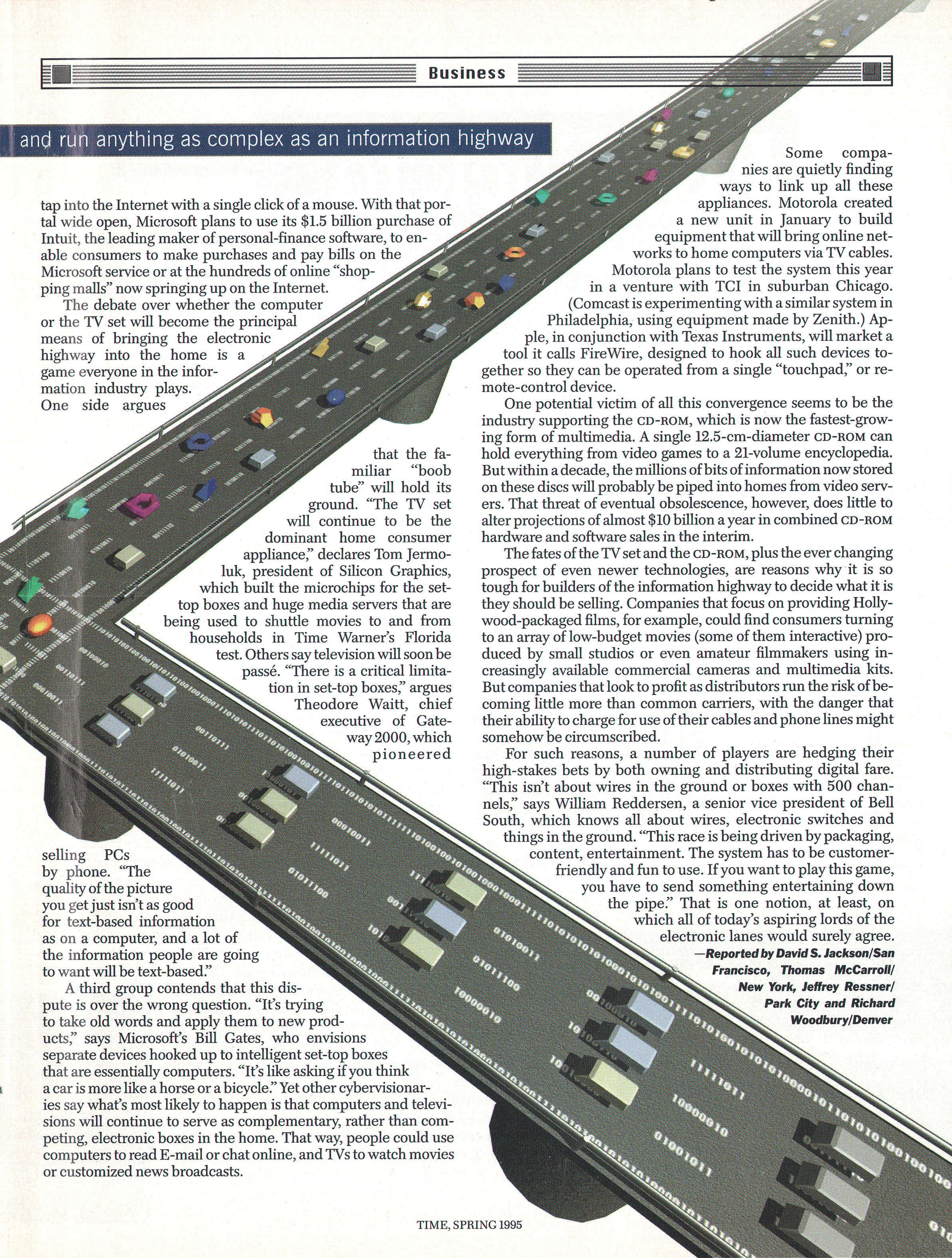
But these arrangements can also sow tension and slow progress, because they tend to unite friends and foes alike in potentially uncomfortable situations. Bell Atlantic and U S West are building separate electronic highways, for example, even as the two firms are allied in a project to provide wireless phone service. Time Warner and TCI are archrivals, yet they have teamed with Sega of America to form the Sega Channel, which could go out over the companies' superhighways. Entanglements like these have given rise to a new term: coopetition. Notes communications consultant Jeffrey Kagan: "It can be very difficult to share secrets with a partner and keep them away from a competitor when they're one and the same company."

The relationship between the interactive-television model of the I-way and the PC-based Internet is itself complex. The Internet provides free access to a vast array of computer bulletin boards and other services, while interactive systems will charge for every minute that consumers use them. Yet some companies are already charging entry fees for the news and entertainment they put up on the Internet, thereby imposing top-down control on what has been an information freeway. "Fewer and fewer people are controlling not just entertainment, but information as well," frets independent filmmaker John Sayles. "There'll be a lot of experimentation at first, but then it will come down to a handful of players again."

The Internet has its own drawbacks as a popular medium. For example, it lacks the fiber-optic and coaxial cable to carry anything like the volume of films and other fare that the electronic highway plans to offer. And since no one owns or oversees the Internet, no large companies have a stake in making the substantial investments needed to upgrade the system. For such reasons, many Net watchers expect the Internet and interactive cable-TV architectures to mesh eventually in some fashion. "Most people assume that the two worlds are going to intersect," says Lotus Development Corp. founder Mitch Kapor. "But nobody knows when or how that is going to happen."

For now, many hardware and software suppliers are in the happy position of selling their products to all the combatants in cyberspace. Intel, whose microchips run 80% of the world's 150 million personal computers, hopes to provide the chips for the TV set–top boxes that will translate and control the digital signals flowing over the information highway. The Silicon Valley company also has alliances with more than two dozen partners. Among them: CNN (for two-way TV news) and Bell Atlantic (for video-conferencing hardware).

Microsoft too is seeking a dominant position in the interactive age. Among other projects, it is writing two-way TV software for Hewlett Packard and Silicon Graphics, video-services software for Japan's NTT and satellite-communications software for McCaw Cellular. Microsoft's most ambitious new venture will come out later this year when the company's long-awaited operating system Windows 95 arrives, complete with free software to give users access to the company's new online bulletin board. The bulletin board will allow users to and run anything as complex as an information highway



tap into the Internet with a single click of a mouse. With that portal wide open, Microsoft plans to use its $1.5 billion purchase of Intuit, the leading maker of personal-finance software, to enable consumers to make purchases and pay bills on the Microsoft service or at the hundreds of online "shopping malls" now springing up on the Internet.

The debate over whether the computer or the TV set will become the principal means of bringing the electronic highway into the home is a game everyone in the information industry plays. One side argues that the familiar "boob tube" will hold its ground. "The TV set will continue to be the dominant home consumer appliance," declares Tom Jermoluk, president of Silicon Graphics, which built the microchips for the set-top boxes and huge media servers that are being used to shuttle movies to and from households in Time Warner's Florida test. Others say television will soon be passé. "There is a critical limitation in set-top boxes," argues Theodore Waitt, chief executive of Gateway 2000, which pioneered selling PCs by phone. "The quality of the picture you get just isn't as good for text-based information as on a computer, and a lot of the information people are going to want will be text-based."

A third group contends that this dispute is over the wrong question. "It's trying to take old words and apply them to new products," says Microsoft's Bill Gates, who envisions separate devices hooked up to intelligent set-top boxes that are essentially computers. "It's like asking if you think a car is more like a horse or a bicycle." Yet other cybervisionaries say what's most likely to happen is that computers and televisions will continue to serve as complementary, rather than competing, electronic boxes in the home. That way, people could use computers to read E-mail or chat online, and TVs to watch movies or customized news broadcasts.

Some companies are quietly finding ways to link up all these appliances. Motorola created a new unit in January to build equipment that will bring online networks to home computers via TV cables. Motorola plans to test the system this year in a venture with TCI in suburban Chicago. (Comcast is experimenting with a similar system in Philadelphia, using equipment made by Zenith.) Apple, in conjunction with Texas Instruments, will market a tool it calls FireWire, designed to hook all such devices together so they can be operated from a single "touchpad," or remote-control device.

One potential victim of all this convergence seems to be the industry supporting the CD-ROM, which is now the fastest-growing form of multimedia. A single 12.5-cm-diameter CD-ROM can hold everything from video games to a 21-volume encyclopedia. But within a decade, the millions of bits of information now stored on these discs will probably be piped into homes from video servers. That threat of eventual obsolescence, however, does little to alter projections of almost $10 billion a year in combined CD-ROM hardware and software sales in the interim.

The fates of the TV set and the CD-ROM, plus the ever changing prospect of even newer technologies, are reasons why it is so tough for builders of the information highway to decide what it is they should be selling. Companies that focus on providing Hollywood-packaged films, for example, could find consumers turning to an array of low-budget movies (some of them interactive) produced by small studios or even amateur filmmakers using increasingly available commercial cameras and multimedia kits. But companies that look to profit as distributors run the risk of becoming little more than common carriers, with the danger that their ability to charge for use of their cables and phone lines might somehow be circumscribed.

For such reasons, a number of players are hedging their high-stakes bets by both owning and distributing digital fare. "This isn't about wires in the ground or boxes with 500 channels," says William Reddersen, a senior vice president of Bell South, which knows all about wires, electronic switches and things in the ground. "This race is being driven by packaging, content, entertainment. The system has to be customer-friendly and fun to use. If you want to play this game, you have to send something entertaining down the pipe." That is one notion, at least, on which all of today's aspiring lords of the electronic lanes would surely agree.

—Reported by David S. Jackson/San Francisco, Thomas McCarroll/New York, Jeffrey Ressner/Park City and Richard Woodbury/Denver

Just Click to Buy

By JANICE CASTRO

Madison Avenue meets the online world—and neither will be the same again

THE EARTH DIDN'T MOVE ON JAN. 1, 1954, WHEN NBC AIRED THE TOURNAMENT of Roses Parade from Pasadena, California—the first national, commercially sponsored TV program broadcast in living color. In fact, most of the viewers in the 21 cities that carried the show could only imagine the colors, since virtually all TV sets then were still black-and-white. But it was a beginning. Within 20 years, not only did nearly every American home have a television set, but most of the sets were in color. Families were eating their dinner on trays in front of the TV rather than miss one minute of a show. Madison Avenue had found a powerful new tool that allowed it to reach huge numbers of consumers right in their homes. Advertising flowered with creativity, producing its own 60-second shows called commercials, building on copy written for print ("Wonder Bread helps build strong bodies 12 ways!") and eventually creating new art forms with jingles ("It's the real thing"). The revenues ($35 billion a year by 1994) financed a vast new wave of entertainment and information programming, from *Bonanza* to live coverage of presidential election campaigns.

Now it's happening again. A **new medium** has arrived, and it is bringing about a change in marketing that is potentially even more profound than the coming of television. As it reaches into the tens of millions, the number of computer users is suddenly attracting advertisers' attention. During the past few months alone, thousands of companies eager to reach this burgeoning audience of upscale consumers (estimated average income: $55,000) have begun advertising online.

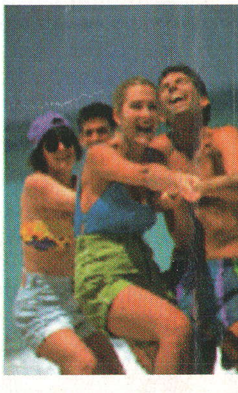
Only a few years ago, most marketers were dismissing this audience as beyond the reach of advertising. Cyberspace, after all, was peopled by gearheads and techno-junkies fiercely opposed to any form of commercial intrusion. But as cyberspace grows, its population begins to approach mainstream. Most users now accept advertising—in fact, research shows that many welcome it. As a group, though, they remain highly independent, primarily interested in seeking out useful information for themselves. Agencies are learning some **new tricks**, and the ad game may never be the same again.

The computer medium turns traditional big-brand advertising on its head. No longer is it enough to deliver a simple message that appeals to everyone—to say in sweeping terms to a mass audience, "Buy this car [or beer, or soap, or airline ticket] and get this life." Online consumers talk back. They demand instant information. The moment they lose interest, one click of the computer mouse, and they are gone. There is no lingering until the show comes back on. In order to hold their attention, advertisers are developing "interactive" advertising that delivers the message in successive layers as part of a **dialogue** with the consumer. Once the individual shows interest in the initial pitch, the interactive advertiser moves to the next stage, which delivers a message designed specifically for that customer.

Club Med, for example, quickly sorts Net surfers who happen upon their richly illustrated Internet **home page** into separate categories by inviting them to answer a few questions at the outset. Prospective vacationers with families proceed to one online brochure, while **singles** seeking to meet new friends, or people who are seeking a resort that

Club Med®
Life as it should be™

Dive right in
Click on the map and pick an island or click on your favorite sport for a list of resorts where you can play. Just want to kick back? Pick a beach (*click!*) and book a trip.



features scuba diving, are steered to other presentations, all of them studded with color pictures of beaches and happy vacationers—and lots of facts. Thanks to the new technology online, a highlighted phrase or a color photograph can serve as a doorway: **click on it**, and you are transported to another realm of information. The payoff for this complex sales effort is that the advertiser gains an unprecedented opportunity to tailor the message precisely to the individual customer and give consumers as much information as they desire.

Interactive advertising presents special challenges, though. There is no equivalent online version, for example, of the prime-time network television shows or the leading national publications that gather huge numbers of people to look at a well-placed message from a sponsor. The main challenge for marketers is in learning how to attract a sizable audience in the diffuse landscape of cyberspace. Going online is like driving alone from place to place along previously unmapped roads, occasionally zooming off in a new direction on impulse. This is particularly true on the Internet, with its vast frontier of **isolated sites**. Travelers tend to dart about, unseen, on a spider web of electronic back roads. Says Mark Loncar, a vice president for CKS Pictures, a hot online ad shop in Cupertino, California: "People go online for information, not for entertainment. They're more targeted, more focused." Interactive marketers must convince these independent cruisers to come take a look at their messages.

ONE WAY IS TO ERECT SIGNPOSTS ON THOSE BACK ROADS. UNTIL RECENTLY, there was nothing like a directory to guide consumers around the Net. Now there are all kinds of directories available, from shopping listings to business-to-business directories. Online shopping centers are springing up everywhere, inviting customers to use their credit cards to buy on impulse, without even leaving their chairs. Since opening its interactive doors last October, Cybermalls, a Vermont shopping center with nearly 60 **online businesses** ranging from a coffee store to a marine equipment shop, has built up bustling traffic, in part, by offering free information on **ski conditions** and vacation resorts.

The most popular products sold online are what one industry expert calls the "distance stuff," such as books, software, outdoor gear, packaged foods and collectibles, that people can buy without needing to touch them or try them on. These are the same products, in fact, that Americans normally buy through mail-order catalogs, which rang up $57 billion in sales last year. Craig Gugel, senior vice president for interactive media for Ted Bates in New York City, compares the present state of online advertising with the early days of cable TV, just before its rapid growth during the mid-1980s. Says Gugel: "Interactive media is going to explode over the next five to 10 years. Online advertising is out there now, but interactive television is coming next."

So far, though, most online advertising is being produced by small shops, while the big agencies that produce most of America's advertising watch nervously from the sidelines. In February, Raymond Smith, chief executive officer of Bell Atlantic, told advertising professionals in Manhattan that the big agencies had better get serious about interactive advertising, or someone else will get the work. "You can jump in early and help create this exciting new medium," he said, "or you can let the world pass you by, and find yourself operating the best darned buggy-whip business on Madison Avenue." Smith's warning followed a rocket from Edwin Artzt, chairman of Procter & Gamble, the largest U.S. advertiser. Last year Artzt told agencies that unless Madison Avenue gets its interactive act together, companies like his will find other ways to tell consumers about their **products**. Manufacturers are already diverting advertising dollars to direct marketing; many see the online medium as a way to expand such efforts. The arrival of two-way television will raise the stakes even more. If interactive-TV systems fulfill expectations, viewers as independent as today's Net surfers will be able to travel not just to Websites on flat-panel computer screens but also into home theaters filled with ganglia-tingling news, entertainment and shopping options that they can choose with the flick of a remote-control button. Madison Avenue's big challenge will then be to get consumers to use that same remote-control device to buy an airline ticket to Club Med and, eventually, even a car.

—With reporting by Robertson Barrett/New York and David S. Jackson/San Francisco

Go to Vermont Enter Cybermalls by clicking on the red button, far left. Drop into Joan & Annie's and order some snacks. Or click into Cybermont for the latest on ski conditions—and (*click!*) pick a vacation package.

By Robert Hughes

Take This Revolution...

TIME's *art critic scorns the siren call of "utopian fantasies"*

About 45 years ago, when I was a small boy in Australia, I naturally knew all about America and what it was going to become. It was already the most powerful nation on earth. But though this seemed a little abstract to me, what I liked especially were the prospects for ordinary everyday life in the future, the American Future.

Remember the future? Mr. America would commute to work from immaculate garden suburbs in a personal helicopter or, even better from the 10-year-old's point of view, with a propeller driven by an atom-powered beanie on his head. His office walls would be now opaque, now transparent as crystal, at the touch of a button. At home Mrs. America would touch another button, and delicious meat loaf, prepared by robot hands and indistinguishable from the efforts of the finest French chef, would pop steaming from a slot. Or else a pill would supply each member of her brood with the nutritional equivalent of a turkey sandwich and a slice of pie. Crime would be abolished by the magic of electronic surveillance. And so on, and so forth.

Every dream of the future is an artifact of the present and bears its indelible stamp. Prophecies tell us more about the present than what is going to come. This is why the archaeology of the future is so fraught with pathos, irony and nostalgia for vanished innocence. Gazing through grimy windows at the chaotic entropy of our cities, contemplating the foil trays of "gourmet" gunk that issue from our microwave units, locked in the honking metal glacier of the rush hour, wondering what the kids have been sniffing in the suburban mall, we recognize the hopelessly degraded lineaments of those earlier utopian fantasies . . . and sigh.

So it will be with America's fixation on the cultural benefits of computers and interactive multimedia. Americans are suckers for utopian promises. They have been ever since the Puritans invented the idea of radical newness, in the 17th century. We will look back on what is now claimed for the information superhighway and wonder how we ever psyched ourselves into believing all that bulldust about social fulfillment through interface and connectivity. But by then we will have some other fantasy to chase, its approaches equally lined with entrepreneurs and flacks, who will be its main beneficiaries.

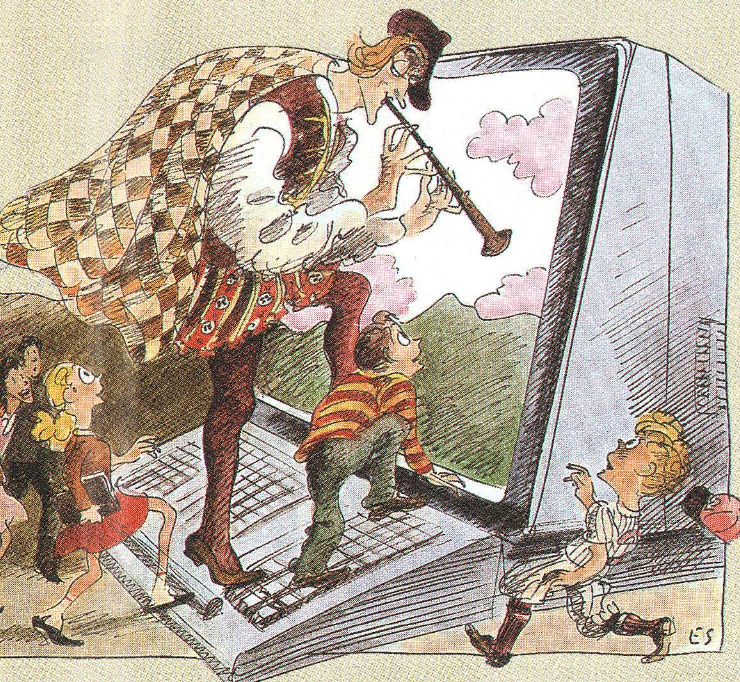
Let me hastily assert that I am no Luddite. Luddites wanted to smash machinery, believing that it was throwing handcraftsmen out of work. Skepticism is not Luddism. I do not want to smash my PC or anyone else's—although there have been moments when, trying to get some mulish program to run, I thought of throwing it out the window. I doubt if I could now work without my IBM clone, though I treat it strictly as a typewriter and filing system with a big memory.

So why am I thus wasting its potential? Why is my ancient Hayes Smartmodem 1200 switched off most of the time, when it could be patching me into the Internet? Basically because there is only so much time in the day, and there are a lot of things I would rather be doing—writing, for instance, or checking the drag mechanism on a fly reel, or conversing with wife and friends, or interfacing (that word!) with Phoebe the speckled bitch, or planting peas in early spring, or looking at pictures in a museum, or, above all, reading a book—than exchanging ephemeral gossip with faceless strangers over the electronic equivalent of the backyard fence.

The Internet, it seems, speaks to America's unappeasable terror of loneliness, a fear that overflows into a mistrust of one of life's most precious assets, optional solitude. Americans, it is said, already watch seven to eight hours of TV a day. Now other Americans—not all that many at present, but their numbers are growing—spend up to 25 hours a week on the Net, goggling at another kind of screen, and call it community empowerment. To them, one is tempted to say, Get a life!

As the virtual social space of the various networks increases, so will the real social spaces of America decay and implode. Why keep them up? The only mildly paranoid might add that although interactivity may blossom as a democratic agora of opinion, releasing us from our dependence on Big Media, it also contains unexplored possibilities of social control. In the 18th century Jeremy Bentham proposed a form of prison in which all inmates would be totally open to inspection at all times: the panopticon. This was one of the germs of the totalitarian state: virtue through surveillance. The cable that brings information into your home can also carry information out of it. Can you be sure who is on the other end of the wire? Is there a delete key for all you put on the Net?

We are beset by the virtual. Virtual reality, virtual neighbors, virtual history, virtual sex and now—thanks to the facile rhetoric of social rebirth emanating from Washington—virtual virtue. Some people, particularly those who like to strike



prophetic attitudes about the future, feel deprived if they are not inundated by something called "information" moving in weightless bytes at the speed of light. Mostly, what they call information is just raw data of trivial significance. Personally, I find the flow of words from books, at less than warp speed, quite difficult enough to keep up with—not that anyone can.

AH, THEM BOOKS. ONE OF THE THINGS INFOBAHNERS like to claim is that all the rest of "culture"—including books and paintings and presumably virtual-reality tours of architecture as well—will eventually be available in cyberspace: All Human Knowledge Will Be There. With a roll and a click of the mouse, we will summon Titian's *Assumption* from the Frari in Venice onto our home screen, faithful in every respect—except that it isn't, being much smaller, with different (electronic) color, no texture, no surface and no physical reality, and in no way superior (except for the opportunity to zoom in on detail) to an ink reproduction in a book. Which is fine, especially for archivists and iconographers, but how many people will realize that the only way to know Titian is to study the actual, unedited physical works of his hands, in real space, not cyberspace?

Thus the printed book, as a cultural delivery system (See how easy the jargon is?), will become as obsolete in a cyberspatial society as the illuminated manuscript did after Caxton and Gutenberg. People have been saying this, in books of course, for several decades. But will it? The vast majority of books have not been converted to bits and almost certainly never will be, because they have no readership big enough to "justify" the huge task of digitalizing them all. One can well imagine digitalized versions of fundamental classics like *Antony and Cleopatra* or *Moby Dick*, or popular lit-kitsch like Maya Angelou's poetry, making it onto the small screen at some point, to satisfy mass demands from English Lit courses. But (to pick out the first three titles I see on a shelf in my home office) what about the collected poems of Christopher Smart or J.C. Beaglehole's *The Exploration of the Pacific* or Camões' *Os Lusiadas*? In sum, what about the tens of millions of titles for which there is absolutely no popular demand and which can only be consulted as print on paper? *Fuhgeddabowdit.*

Nothing in the persuasively foreseeable future can or will replace the printed book, and the relation of cyberspace to literature hangs on a Rube Goldberg–like joke: the idea of needing an expensive electronic machine, available only to the relatively well-off and dependent on an external power source, to perform the act of reading. Besides, there is not now and probably never will be a computer that you can get sand in and spill coffee on without impairing it, as you can with a book, a magazine or a newspaper. And the more you make information flow dependent on costly hardware, the more you separate the info rich and the info poor, thus adding new layers to America's already vicious class inequalities. Anyone and everyone can spend 50¢ on a newspaper. It is by no means certain that the digital newspaper of the projected future, the silicon sheet you can plug into a wall jack for the day's info fix, will be widely accessible in the slums, ghettos and trailer parks of America.

Interactivity may add much less to the sum of human knowledge than we think. But it will deluge us with entertainment, most of which will be utter schlock. There isn't enough production talent or inventiveness in America today to fill the TV networks and cable outlets with halfway-decent programming; does anyone seriously imagine that there will be enough to fill the promised 500 channels, or the threatened 50,000, with anything but electronic drivel? All the cables will lead back to an enormous, leaking landfill of vicarious crap. Incredible sums of money will be made from this. In the not too distant future, when Bill Gates realizes he has succeeded in spending $30.8 million on the only Leonardo manuscript that doesn't have a single drawing of real aesthetic significance in it, he will be able to off-load it for $60 million onto David Geffen or Michael Ovitz. Thus civilization progresses.

A large beneficiary, as all in the entertainment industry know but none will admit, will be pornography. Strap on your helmet and enter the wonderworld of virtual S&M; doubtless the suits are planning such things at their conferences in Aspen already. This must be why every propagandist for the zillion-channel environment talks piously about "education." Whenever an American entrepreneur invokes education in this context, it behooves the citizen to smell a rat. Education is, or ought to be, about reality, and the dark star that lurks out there in cyberspace has less to do with reality than with the infinite replication of simulacrums, a hugely overscaled way—in Neil Postman's famous phrase—of amusing ourselves to death. ■

ILLUSTRATION FOR TIME BY ED SOREL

It's a Wired, Wired World

The Global Village is coming, but everyone will reach it at a different pace

By JAMES O. JACKSON / Brussels

LONDON HAS A CAFE CALLED Cyberia that sells a cup of cappuccino for $2.35—and for $2.85 half an hour's access to the Internet on one of its 10 computers. Waiters there not only pour the coffee but also provide technical expertise for "newbies" who are making their first foray into the Net.

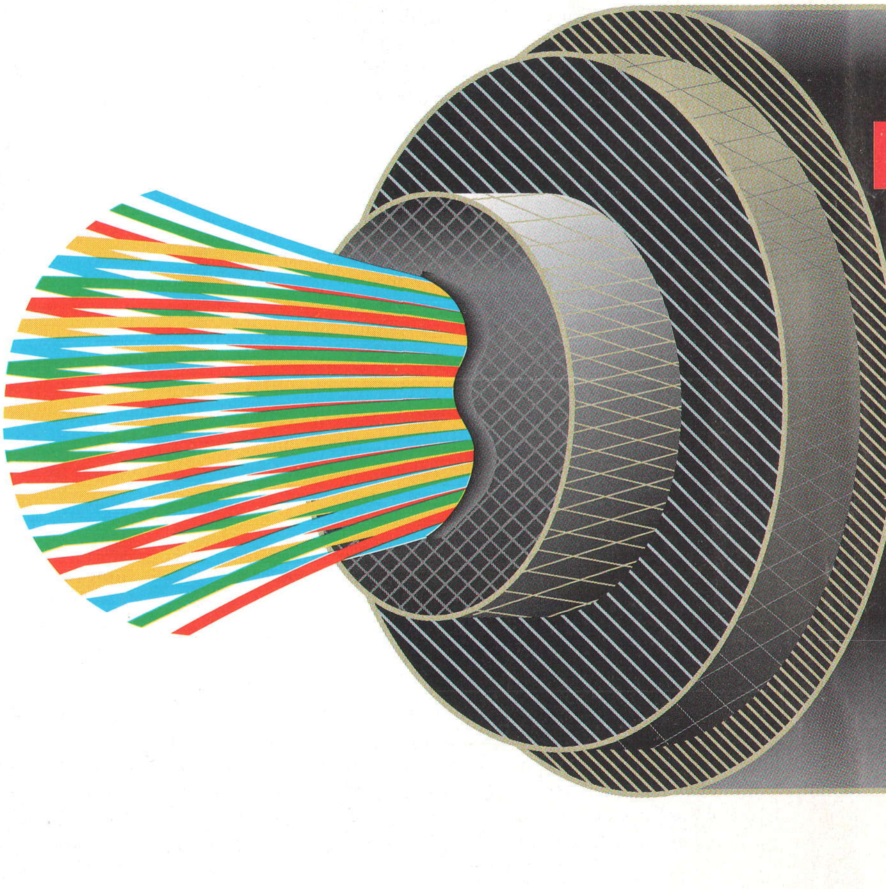
The Japanese call it *"maruchimedia"*—multimedia—and they plan to connect it to nearly every Japanese home by the year 2010. Their carrier: a nationwide supersophisticated fiber-optic system being encouraged by the Ministry of Posts and Telecommunications.

In Hong Kong 600 of the city's skyscrapers are already wired with fiber optics and rate as "intelligent buildings." The colony's 6 million residents are so interconnected that the better restaurants forbid patrons to talk on their cellular telephones while eating.

And in Moscow, browsers at the jam-packed Mitino open-air computer market can pick up crateloads of pirated software, state-of-the-art motherboards and warp-speed modems—and then go home to the frustrating task of trying (often without success) to tie them into computer networks using telephone lines that date from Lenin's day.

Little by little, the world is getting wired. Despite some big bare spots in middle Africa, Mongolia and the real Siberia (as opposed to the Cyberia Café), PCs and their attendant modems are knitting together the global village just as Marshall McLuhan predicted. While no country is as well connected as the U.S., with 32 PCs per 100 citizens, Europe and Asia are coming up fast. Among the reasons are the privatization of industry, which is breaking the stranglehold of government telecommunications monopolies, and the recognition by political leaders of the vital importance of getting up to speed on the worldwide Infobahn (as the Europeans prefer to call it).

The global revolution encompasses every instrument of communication, from pagers to cell phones to CD-ROM. The main gauge of change in information delivery is the boom in sales of modems, which are expected to grow at an average rate of 17.2% worldwide (22.4% in Europe alone) between 1994 and 1998, and the expanding reach of the Internet and such commercial operators as CompuServe. "Sales of CD-ROM drives are doubling and tripling this year," says Deborah Monas, an analyst



at London's Kagan World Media. The next 10 years are expected to bring a boom that will put much of the developed world on a par with the U.S. Monas predicts that as many as 42.5% of Europe's 153 million TV households will have PCs by 2003 and that 93% of those machines will be equipped with CD-ROM drives. "The U.S. could reach 57% [home-PC penetration] by 2003," she says, "and Britain could catch up to that figure by then. Germany may be even higher." In Japan, PC penetration is 8.8 per 100 households and growing, while Singapore's authoritarian leadership has vowed to make that country an "intelligent island" by 2000.

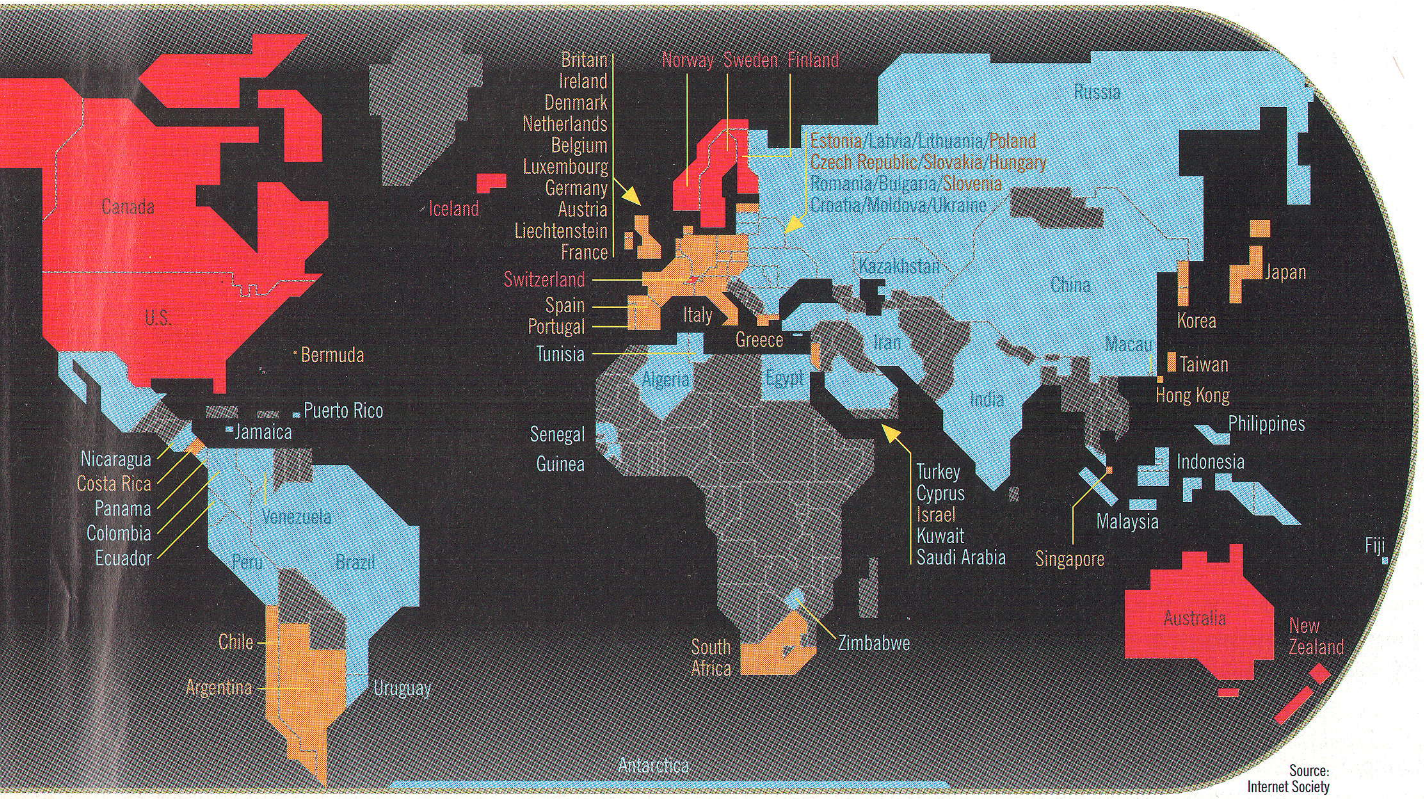
The case of Singapore highlights the fact that the cyberworld is not—and probably never will be—a global village in which everybody speaks the same language and thinks the same thoughts. On the contrary, every country tends to remodel its piece of the network according to its cultural preferences. Even Canada, despite its many commonalities with the U.S.—including its phone system—does things its own way. "Are we any different?" asks David Sutherland, head of computing and communications at Ottawa's Carleton University. "The answer is typically Canadian: yes and no. Because of our cultural differences, we seem more bent on local activity than on reaching across the country." In that spirit, Canadians have more local "freenet" connections per capita than their southern cousins—a total of nine community services that provide free local access to the Internet.

CANADIANS ALSO CLAIM A COMPUTER culture that is both more open and more self-regulating than in the U.S. "Our philosophy is to permit an open dialogue" with as little policing as possible, says Sutherland. "We have had the odd loony and the occasional inappropriate posting, but over a year and a half we've had an amazingly civil environment."

Like the U.S., Canada is experimenting with two-way data services. Le Groupe Videotron Limitée, a firm based in Montreal, plans to start an experimental system in the city of Chicoutimi, Quebec, that will send and receive electronic mail, regulate thermostats, order pay-per-view movies and get weather reports and stock market quotes. If it works, the plan is to widen it to as many as 1.5 million homes in Montreal and Quebec City.

Outside the relatively well-wired confines of North America, however, getting connected can still be a frustrating and costly experience. In Europe and parts of Asia, monopolistic state telephone systems erect a bewildering array of speed limits and tollgates that make traveling the Infobahn a costly and often frustrating experience. High long-distance fees and connection surcharges levied by monopolistic government communications ministries can make the use of the Internet and such services as CompuServe and America Online unduly expensive for ordinary users. Some countries outlaw communications equipment without an official government imprimatur, which can double or even quadruple the prices of such items as modems and two-way telephone jacks.

The better restaurants forbid patrons to talk on their cellular phones while dining



Source: Internet Society

TIME Graphic by Nigel Holmes

🟥 **HOT** 🟧 **MEDIUM** 🟦 **COOL** ⬛ **No Internet connections**

Rating based on a ratio of people to direct Internet connections, from HOT (200 people or less to each connection) to COOL (5,000-plus people to each connection)

Even after they get connected, users need access to good-quality telephone lines, which are neither as ubiquitous nor as cheap as in the U.S. Waiting lists for phone connections range from mere weeks in France to years—or never—in the communications-deprived nations of the former Soviet Union.

Conscious that a race for the future is on and that the Americans are winning it, European leaders warned their forces, "We've got to get it right and get it right now!"

France is usually cited as the glowing exception to the restrictive European pattern. In the early 1980s, the French government launched Minitel—a small-screen unit with a keyboard that plugs into a normal telephone wall outlet to connect users with a wide variety of information services. Minitel is now a familiar object in many French homes, partly because of its reputation—deserved—as a commercial conduit for suppliers of both hard and soft porn. Despite that sleaze factor, Minitel set the standard during the 1980s as the world's first truly practical and inexpensive provider of interactive services for a mass market. It was, and is, the VW Beetle of the information age.

BUT LIKE THE BEETLE, MINITEL IS in danger of becoming outmoded. With monthly Minitel fees rising just as PC prices are starting to plummet, some users are turning to multimedia vehicles that can connect them with the Internet, or to more varied commercial services. France Telecom is struggling mightily to keep its Minitel lead, partly by forming strategic alliances with foreign communications groups (including AT&T, Sony, Motorola and Apple), but the French effort, like others in Europe, is burdened by the weight of the European Union's burgeoning bureaucracy, which is increasingly inserting barriers across the Continent's communications throughways.

Europeans recognize that a race is on and that the Americans are winning. At the E.U.'s Corfu summit in June, leaders issued a report warning of encroachments from the outside—i.e., America—and admonishing, "We have to get it right, and get it right now." So far, there is nothing in Europe or Asia to compare with the American commercial services such as CompuServe, America Online and Prodigy. The most aggressive of them, CompuServe, has set up local—and low-price—nodes in most of Europe's major cities, offering forums and services in German, French and Dutch. The service is adding new subscribers in German-speaking countries at a rate of 1,500 a week—small by U.S. standards, but significant in a Europe with only a third of America's PC penetration.

Government controls and low consumer consciousness, however, remain bigger problems than access. Most CD-ROM drives are made in Asia, for example, yet two-thirds of installed CD-ROM units are in America. Japan, a nation of superb hardware innovators, is ranked only 18th in the world in terms of PCs—largely because there is not much to connect with in Japan. Japan is also far behind the U.S. in hooking computers together in networks, although that business started to take off in 1994 as fledgling on-line services like Niftyserve, as well as limited access to Internet, enjoyed a huge surge in customers. Japan's *maruchimedia* may be the hot topic at electronics-industry gatherings, but the Japanese seem bewildered about what it is. "They want to be in the multimedia business," says Roger Mathus, executive director of the U.S. Semiconductor Industry Association in Japan. "But they don't know how to do it. They thrive on having a model they can improve upon, but they don't have one yet."

Instead the Japanese bureaucracy is marshaling its forces for a "multimedia war"—with all the implications of official encouragement that the phrase suggests. The Ministry of Posts and Telecommunications' (M.P.T.) gargantuan plan to run fiber-optic cable into almost every home by 2010 will cost between $330 billion and $500 billion. Critics warn that it is not only an expensive but probably also an unnecessary weapon, since there are no services—current or expected soon—that would actually employ fiber to the home. A hybrid system of coaxial cable and fiber-optic cable does the job just as well for a fraction of the cost.

Meanwhile, the M.P.T. has not had the success it wished for; its budget request for millions in tax-free loans was sharply trimmed in government budget negotiations, partly because eager high-tech companies need no incentives to push networking and multimedia services. The question is how quickly Japan's limited tribe of users will log on to state-of-the-art services. As Yukio Noguchi of Hitotsubashi University wrote recently, "I get the feeling we are being asked to build a tremendously lavish swimming pool, even though only a couple of people know how to swim."

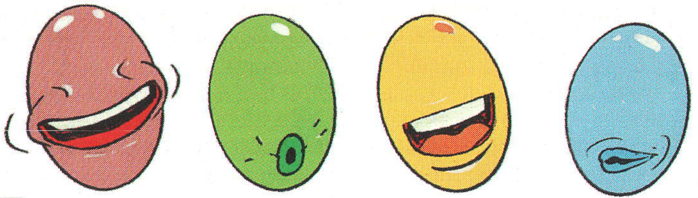
In the former Soviet Union, the reverse is true: lots of enthusiastic swimmers are diving headlong into a few creeks and muddy swimming holes. In the mind of the masses, the computer revolution has long since overtaken the October Revolution as the central reality. At Moscow's Mitino computer market, crowds of men in fur hats shove through haphazard rows of battered metal kiosks crammed with state-of-the-art software—mostly pirated—as well as modems, accelerator cards, chips, CD-ROMS, drives and every other widget and doohickey known to the computer business.

The market is part of a pell-mell private-enterprise rush to catch up after years of communism and the cold war. Until the end of the 1980s, communist regimes strictly controlled communications technology, which they knew could cause their own destruction. And the West placed heavy restrictions on the transfer of technologies that could be used for military purposes. But once Windows 3.1 and its Truetype Cyrillic fonts were introduced in Russia in 1993, the Infobahn was open for business.

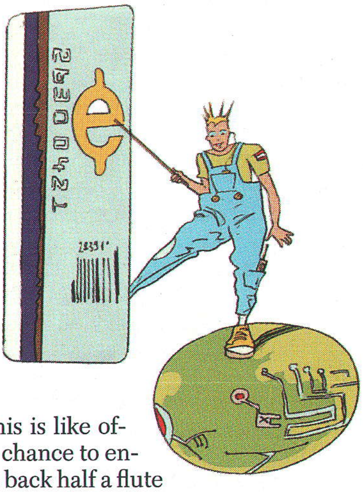
The biggest barrier for the former East bloc countries, however, is not language but technology. Telephone connections are so poor that using a modem to log on to a node—even one inside the Moscow city limits—is difficult and frustrating. Still, Russians are in some ways more connectivity-conscious than West Europeans. A system called VNIPAS, a Russian acronym, linked academic and scientific institutions in Eastern Europe as early as 1987, and a successor network is expanding rapidly into commercial markets. Clients include Caterpillar, GE, *Computerworld* newspaper, the Moscow *News* and the vast scientific research center of Akademgorokok in Novosibirsk. Other systems geared to more popular markets are beginning to show up. So far, the Russian government has made no effort to regulate cyberspace, and none is expected. "They can't regulate the stock market," says Anatoli Voronov, executive director of a populist, anarchic online service known as GlasNet. "Regulating computers must be far down on the list."

The Russians have got that part right, at least. Indeed, for all the world's governments, what is apparent today and is likely to be dramatically so in the future is that attempts to control the global flow of electro-information are not only futile but counterproductive as well. ***—Reported by Edward W. Desmond/Tokyo, Terence Nelan/Moscow, Mary E. Sarotte/Bonn and Gavin Scott/Ottawa***

A new story by Neal Stephenson



THE GREAT SI – MO – LE – ON CAPER



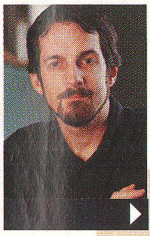
Hard to imagine a less attractive life-style for a young man just out of college than going back to Bismarck to live with his parents—unless it's living with his brother in the suburbs of Chicago, which, naturally, is what I did. Mom at least bakes a mean cherry pie. Joe, on the other hand, got me into a permanent emotional headlock and found some way, every day, to give me psychic noogies. For example, there was the day he gave me the job of figuring out how many jelly beans it would take to fill up Soldier Field.

Let us stipulate that it's all my fault; Joe would want me to be clear on that point. Just as he was always good with people, I was always good with numbers. As Joe tells me at least once a week, I should have studied engineering. Drifted between majors instead, ended up with a major in math and a minor in art—just about the worst thing you can put on a job app.

Joe, on the other hand, went into the ad game. When the Internet and optical fiber and HDTV and digital cash all came together and turned into what we now call the Metaverse, most of the big ad agencies got hammered—because in the Metaverse, you can actually whip out a gun and blow the Energizer Bunny's head off, and a lot of people did. Joe borrowed 10,000 bucks from Mom and Dad and started this clever young ad agency. If you've spent any time crawling the Metaverse, you've seen his work—and it's seen you, and talked to you, and followed you around.

Mom and Dad stayed in their same little house in Bismarck, North Dakota. None of their neighbors guessed that if they cashed in their stock in Joe's agency, they'd be worth about $20 million. I nagged them to diversify their portfolio—you know, buy a bushel basket of Krugerrands and bury them in the backyard, or maybe put a few million into a mutual fund. But Mom and Dad felt this would be a no-confidence vote in Joe. "It'd be," Dad said, "like showing up for your kid's piano recital with a Walkman."

Joe comes home one January evening with a magnum of champagne. After giving me the obligatory hazing about whether I'm old enough to drink, he pours me a glass. He's already banished his two sons to the Home Theater. They have cranked up the set-top box they got for Christmas. Patch this baby into your HDTV, and you can cruise the Metaverse, wander the Web and choose from among several user-friendly operating systems, each one rife with automatic help systems, customer-service hot lines and intelligent agents. The theater's subwoofer causes our silverware to buzz around like sheet-metal hockey players, and amplified explosions knock swirling nebulas of tiny bubbles loose from the insides of our champagne glasses. Those low frequencies must penetrate the young brain somehow, coming in under kids' media-hip radar and injecting the edfotainucational muchomedia bitstream direct into their cerebral cortices.



GARY L. BENSON FOR TIME

Neal Stephenson wrote Snow Crash. *His latest novel,* The Diamond Age, *was just published by Bantam.*

"Hauled down a mother of an account today," Joe explains. "We hype cars. We hype computers. We hype athletic shoes. But as of three hours ago, we are hyping a currency."

"What?" says his wife Anne.

"Y'know, like dollars or yen. Except this is a new currency."

"From which country?" I ask. This is like offering lox to a dog: I've given Joe the chance to enlighten his feckless bro. He hammers back half a flute of Dom Perignon and shifts into full-on Pitch Mode.

"Forget about countries," he says. "We're talking Simoleons—the smart, hip new currency of the Metaverse."

"Is this like E-money?" Anne asks.

"We've been doing E-money for e-ons, ever since automated-teller machines." Joe says, with just the right edge of scorn. "Nowadays we can use it to go shopping in the Metaverse. But it's still in U.S. dollars. Smart people are looking for something better."

That was for me. I graduated college with a thousand bucks in savings. With inflation at 10% and rising, that buys a lot fewer Leinenkugels than it did a year ago.

"The government's never going to get its act together on the budget," Joe says. "It can't. Inflation will just get worse. People will put their money elsewhere."

"Inflation would have to get pretty damn high before I'd put my money into some artificial currency," I say.

"Hell, they're *all* artificial," Joe says. "If you think about it, we've been doing this forever. We put our money in stocks, bonds, shares of mutual funds. Those things represent real assets—factories, ships, bananas, software, gold, whatever. Simoleons is just a new name for those assets. You carry around a smart card and spend it just like cash. Or else you go shopping in the Metaverse and spend the money online, and the goods show up on your doorstep the next morning."

I say, "Who's going to fall for that?"

"Everyone," he says. "For our big promo, we're going to give Simoleons away to some average Joes at the Super Bowl. We'll check in with them one, three, six months later, and people will see that this is a safe and stable place to put their money."

"It doesn't inspire much confidence," I say, "to hand the stuff out like Monopoly money."

He's ready for this one. "It's not a handout. It's a sweepstakes."

ILLUSTRATIONS FOR TIME BY ISTVAN BANYAI

And that's when he asks me to calculate how many jelly beans will fill Soldier Field.

Two hours later, I'm down at the local galaxy-class grocery store, in Bulk: a Manhattan of towering Lucite bins filled with steel-cut rolled oats, off-brand Froot Loops, sun-dried tomatoes, prefabricated s'mores, macadamias, French roasts and pignolias, all dispensed into your bag or bucket with a jerk at the handy Plexiglas guillotine. Not a human being in sight, just robot restocking machines trundling back and forth on a grid of overhead catwalks and surveillance cameras hidden in smoked-glass hemispheres. I stroll through the gleaming Lucite wonderland holding a perfect 6-in. cube improvised from duct tape and cardboard. I stagger through a glitter gulch of Gummi fauna, Boston baked beans, gobstoppers, Good & Plenty, Tart'n Tiny. Then, bingo: bulk jelly beans, premium grade. I put my cube under the spout and fill it.

Who guesses closest and earliest on the jelly beans wins the Simoleons. They've hired a Big Six accounting firm to make sure everything's done right. And since they can't actually fill the stadium with candy, I'm to come up with the Correct Answer and supply it to them and, just as important, to keep it secret.

I get home and count the beans: 3,101. Multiply by 8 to get the number in a cubic foot: 24,808. Now I just need the number of cubic feet in Soldier Field. My nephews are sprawled like pithed frogs before the HDTV, teaching themselves physics by lobbing antimatter bombs onto an offending civilization from high orbit. I prance over the black zigzags of the control cables and commandeer a unit.

Up on the screen, a cartoon elf or sprite or something pokes its head out from behind a window, then draws it back. No, I'm not a paranoid schizophrenic—this is the much-hyped intelligent agent who comes with the box. I ignore it, make my escape from Gameland and blunder into a lurid district of the Metaverse where thousands of infomercials run day and night, each in its own window. I watch an ad for Chinese folk medicines made from rare-animal parts, genetically engineered and grown in vats. Grizzly-bear gallbladders are shown growing like bunches of grapes in an amber fluid.

The animated sprite comes all the way out, and leans up against the edge of the infomercial window. "Hey!" it says, in a goofy, exuberant voice, "I'm Raster! Just speak my name—that's Raster—if you need any help."

I don't like Raster's looks. It's likely he was wandering the streets of Toontown and waving a sign saying WILL ANNOY GROWNUPS FOR FOOD until he was hired by the cable company. He begins flying around the screen, leaving a trail of glowing fairy dust that fades much too slowly for my taste.

"Give me the damn encyclopedia!" I shout. Hearing the dread word, my nephews erupt from the rug and flee.

So I look up Soldier Field. My old Analytic Geometry textbook, still flecked with insulation from the attic, has been sitting on my thigh like a lump of ice. By combining some formulas from it with the encyclopedia's stats . . .

"Hey! Raster!"

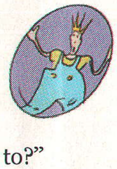
Raster is so glad to be wanted that he does figure eights around the screen. "Calculator!" I shout.

"No need, boss! Simply tell me your desired calculation, and I will do it in my head!"

So I have a most tedious conversation with Raster, in which I estimate the number of cubic feet in Soldier Field, rounded to the nearest foot. I ask Raster to multiply that by 24,808 and he shoots back: 537,824,167,717.

You can actually whip out a gun and blow the Energizer Bunny's head off

A nongeek wouldn't have thought twice. But I say, "Raster, you have Spam for brains. It should be an exact multiple of eight!" Evidently my brother's new box came with one of those defective chips that makes errors when the numbers get really big.



Raster slaps himself upside the head; loose screws and transistors tumble out of his ears. "Darn! Guess I'll have to have a talk with my programmer!" And then he freezes up for a minute.

My sister-in-law Anne darts into the room, hunched in a don't-mind-me posture, and looks around. She's terrified that I may have a date in here. "Who're you talking to?"

"This goofy I.A. that came with your box," I say. "Don't ever use it to do your taxes, by the way."

She cocks her head. "You know, just yesterday I asked it for help with a Schedule B, and it gave me a recipe for shellfish bisque."

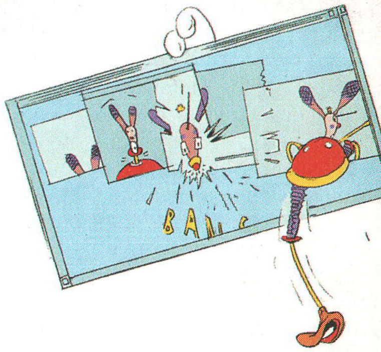
"Good evening, sir. Good evening, ma'am. What were those numbers again?" Raster asks. Same voice, but different inflections—more human. I call out the numbers one more time and he comes back with 537,824,167,720.

"That sounds better," I mutter.

Anne is nonplussed. "Now its voice recognition seems to be working fine."

"I don't think so. I think my little math problem got forwarded to a real human being. When the conversation gets over the head of the built-in software, it calls for help, and a human steps in and takes over. He's watching us through the built-in videocam," I explain, pointing at the fish-eye lens built into the front panel of the set-top box, "and listening through the built-in mike."

Anne's getting that glazed look in her eyes; I grope for an analog analogy. "Remember *The Exorcist*? Well, Raster has just been possessed, like the chick in the flick. Except it's not just Beelzebub. It's a customer-service rep."

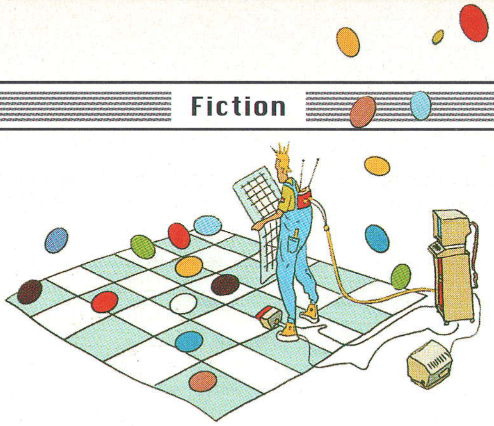


I've just walked blind into a trap that is yawningly obvious to Anne. "Maybe that's a job you should apply for!" she exclaims.

The other jaw of the trap closes faster than my teeth chomping down on my tongue: "I can take your application online right now!" says Raster.

My sister-in-law is the embodiment of sugary triumph until the next evening, when I have a good news/bad news conversation with her. Good: I'm now a Metaverse customer-service rep. Bad: I don't have a cubicle in some Edge City office complex. I telecommute from home—from her home, from her sofa. I sit there all day long, munching through my dwindling stash of tax-deductible jelly beans, wearing an operator's headset, gripping the control unit, using it like a puppeteer's rig to control other people's Rasters on other people's screens, all over the U.S. I can see them—the wide-angle view from their set-top boxes is piped to a window on my screen. But they can't see me—just Raster, my avatar, my body in the Metaverse.

Ghastly in the mottled, flattening light of the Tube, people ask me inane questions about arithmetic. If they're asking for help with recipes, airplane schedules, child-rearing or home improvement, they've already been turfed to someone else. My expertise is pure math only.



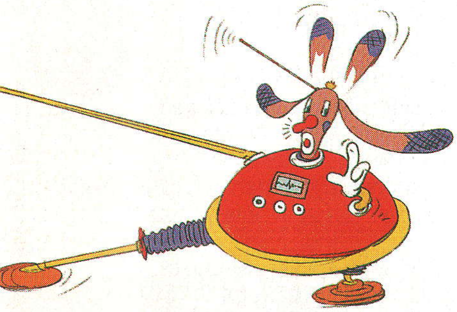
Which is pretty sleepy until the next week, when my brother's agency announces the big Simoleons Sweepstakes. They've hired a knot-kneed fullback as their spokesman. Within minutes, requests for help from contestants start flooding in. Every Bears fan in Greater Chicago is trying to calculate the volume of Soldier Field. They're all doing it wrong; and even the ones who are doing it right are probably using the faulty chip in their set-top box. I'm in deep conflict-of-interest territory here, wanting to reach out with Raster's stubby, white-gloved, three-fingered hand and slap some sense into these people.

But I'm sworn to secrecy. Joe has hired me to do the calculations for the Metrodome, Three Rivers Stadium, RFK Stadium and every other N.F.L. venue. There's going to be a Simoleons winner in every city.

We are allowed to take 15-minute breaks every four hours. So I crank up the Home Theater, just to blow the carbon out of its cylinders, and zip down the main street of the Metaverse to a club that specializes in my kind of tunes. I'm still "wearing" my Raster uniform, but I don't care—I'm just one of thousands of Rasters running up and down the street on their breaks.

Grizzly-bear gallbladders grow like bunches of grapes in an amber fluid

My club has a narrow entrance on a narrow alley off a narrow side street, far from the virtual malls and 3-D video-game amusement parks that serve as the cash cows for the Metaverse's E-money economy. Inside, there's a few Rasters on break, but it's mostly people "wearing" more creative avatars. In the Metaverse, there's no part of your virtual body you can't pierce, brand or tattoo in an effort to look weirder than the next guy.



The live band onstage—jacked in from a studio in Prague—isn't very good, so I duck into the back room where there are virtual racks full of tapes you can sample, listening to a few seconds from each song. If you like it, you can download the whole album, with optional interactive liner notes, videos and sheet music.

I'm pawing through one of these racks when I sense another avatar, something big and shaggy, sidling up next to me. It mumbles something; I ignore it. A magisterial throat-clearing noise rumbles in the subwoofer, crackles in the surround speakers, punches through cleanly on the center channel above the screen. I turn and look: it's a heavy-set creature wearing a T shirt emblazoned with a logo HACKERS 1111. It has very long scythe-like claws, which it uses to grip a hot-pink cylinder. It's much better drawn than Raster; almost Disney-quality.

The sloth speaks: "537,824,167,720."

"Hey!" I shout. "Who the hell are you?" It lifts the pink cylinder to its lips and drinks. It's a can of Jolt. "Where'd you get that number?" I demand. "It's supposed to be a secret."

"The key is under the doormat," the sloth says, then turns around and walks out of the club.

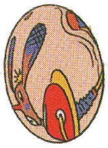
My 15-minute break is over, so I have to ponder the meaning of this through the rest of my shift. Then, I drag myself up out of the couch, open the front door and peel up the doormat.

Sure enough, someone has stuck an envelope under there. Inside is a sheet of paper with a number on it, written in hexadecimal notation, which is what computer people use: 0A56 7781 6BE2 2004 89FF 9001 C782—and so on for about five lines.

The sloth had told me that "the key is under the doormat," and I'm willing to bet many Simoleons that this number is an encryption key that will enable me to send and receive coded messages.

So I spend 10 minutes punching it into the set-top box. Raster shows up and starts to bother me: "Can I help you with anything?"

By the time I've punched in the 256th digit, I've become a little testy with Raster and said some rude things to him. I'm not proud of it. Then I hear something that's music to my ears: "I'm sorry, I didn't understand you," Raster chirps. "Please check your cable connections—I'm getting some noise on the line."



A second figure materializes on the screen, like a digital genie: it's the sloth again. "Who the hell are you?" I ask.

The sloth takes another slug of Jolt, stifles a belch and says, "I am Codex, the Crypto-Anarchist Sloth."

"Your equipment requires maintenance," Raster says. "Please contact the cable company."

"Your equipment is fine," Codex says. "I'm encrypting your back channel. To the cable company, it looks like noise. As you figured out, that number is your personal encryption key. No government or corporation on earth can eavesdrop on us now."

"Gosh, thanks," I say.

"You're welcome," Codex replies. "Now, let's get down to biz. We have something you want. You have something we want."

"How did you know the answer to the Soldier Field jelly-bean question?"

"We've got all 27," Codex says. And he rattles off the secret numbers for Candlestick Park, the Kingdome, the Meadowlands . . .

"Unless you've broken into the accounting firm's vault," I say, "there's only one way you could have those numbers. You've been eavesdropping on my little chats with Raster. You've tapped the line coming out of this set-top box, haven't you?"

"Oh, that's typical. I suppose you think we're a bunch of socially inept, acne-ridden, high-IQ teenage hackers who play sophomoric pranks on the Establishment."

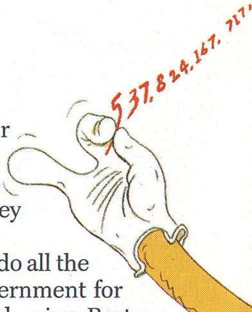
"The thought had crossed my mind," I say. But the fact that the cartoon sloth can give me such a realistic withering look, as he is doing now, suggests a much higher level of technical sophistication. Raster only has six facial expressions and none of them is very good.

"Your brother runs an ad agency, no?"

"Correct."

"He recently signed up Simoleons Corp.?"

"Correct."



"As soon as he did, the government put your house under full-time surveillance."

Suddenly the glass eyeball in the front of the set-top box is looking very big and beady to me. "They tapped our infotainment cable?"

"Didn't have to. The cable people are happy to do all the dirty work—after all, they're beholden to the government for their monopoly. So all those calculations you did using Raster were piped straight to the cable company and from there to the government. We've got a mole in the government who cc'd us everything through an anonymous remailer in Jyväskylä, Finland."

"Why should the government care?"

"They care big-time," Codex says. "They're going to destroy Simoleons. And they're going to step all over your family in the process."

"Why?"

"Because if they don't destroy E-money," Codex says, "E-money will destroy them."

The next afternoon I show up at my brother's office, in a groovily refurbished ex-power plant on the near West Side. He finishes rolling some calls and then waves me into his office, a cavernous space with a giant steam turbine as a conversation piece. I think it's supposed to be an irony thing.

"Aren't you supposed to be cruising the I-way for stalled motorists?" he says.

"Spare me the fraternal heckling," I say. "We crypto-anarchists don't have time for such things."

"Crypto-anarchists?"

"The word panarchist is also frequently used."

"Cute," he says, rolling the word around in his head. He's already working up a mental ad campaign for it.

"You're looking flushed and satisfied this afternoon," I say. "Must have been those two imperial pints of Hog City Porter you had with your baby-back ribs at Divane's Lakeview Grill."

Suddenly he sits up straight and gets an edgy look about him, as if a practical joke is in progress, and he's determined not to play the fool.

Ghastly in the mottled light of the Tube, people ask me inane questions

"So how'd you know what I had for lunch?"

"Same way I know you've been cheating on your taxes."

"What!?"

"Last year you put a new tax-deductible sofa in your home office. But that sofa is a hide-a-bed model, which is a no-no."

"Hackers," he says. "Your buddies hacked into my records, didn't they?"

"You win the Stratolounger."

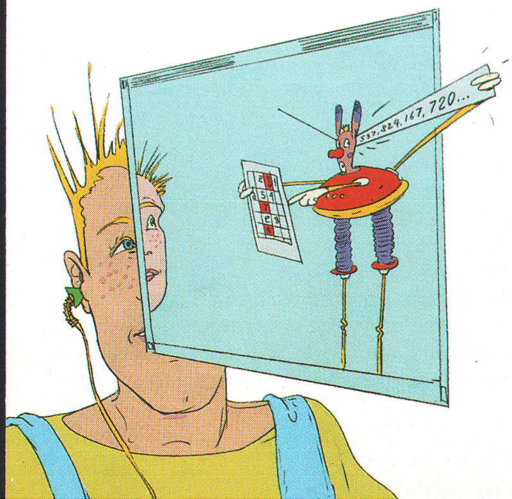
"I thought they had safeguards on these things now."

"The files are harder to break into. But every time information gets sent across the wires—like, when Anne uses Raster to do the taxes—it can be captured and decrypted. Because, my brother, you bought the default data-security agreement with your box, and the default agreement sucks."

"So what are you getting at?"

"For that," I say, "we'll have to go someplace that isn't under surveillance."

"Surveillance!? What the . . . " he begins. But then I nod at the TV in the corner of his office, with its beady glass eye staring out at us from the set-top box.


537,824,167,720...

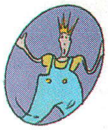
We end up walking along the lakeshore, which, in Chicago in January, is madness. But we hail from North Dakota, and we have all the cold-weather gear it takes to do this. I tell him about Raster and the cable company.

"Oh, Jesus!" he says. "You mean those numbers aren't secret?"

"Not even close. They've been put in the hands of 27 stooges hired by the the government. The stooges have already FedEx'd their entry forms with the correct numbers. So, as of now, all of your Simoleons—$27 million worth—are going straight into the hands of the stooges on Super Bowl Sunday. And they will turn out to be your worst public-relations nightmare. They will cash in their Simoleons for comic books and baseball cards and claim it's safer. They will intentionally go bankrupt and blame it on you. They will show up in twos and threes on tawdry talk shows to report mysterious disappearances of their Simoleons during Metaverse transactions. They will, in short, destroy the image—and the business—of your client. The result: victory for the government, which hates and fears private currencies. And bankruptcy for you, and for Mom and Dad."

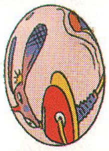
"How do you figure?"

"Your agency is responsible for screwing up this sweepstakes. Soon as the debacle hits, your stock plummets. Mom and Dad lose millions in paper profits they've never had a chance to enjoy. Then your big shareholders will sue your ass, my brother, and you will lose. You gambled the value of the company on the faulty data-security built into your set-top box, and you as a corporate officer are personally responsible for the losses."



At this point, big brother Joe feels the need to slam himself down on a park bench, which must feel roughly like sitting on a block of dry ice. But he doesn't care. He's beyond physical pain. I sort of expected to feel triumphant at this point, but I don't.

So I let him off the hook. "I just came from your accounting firm," I say. "I told them I had discovered an error in my calculations—that my set-top box had a faulty chip. I supplied them with 27 new numbers, which I worked out by hand, with pencil and paper, in a conference room in their offices, far from the prying eye of the cable company. I personally sealed them in an envelope and placed them in their vault."



"So the sweepstakes will come off as planned," he exhales. "Thank God!"

"Yeah—and while you're at it, thank me and the panarchists," I shoot back. "I also called Mom and Dad, and told them that they should sell their stock—just in case the government finds some new way to sabotage your contest."

"That's probably wise," he says sourly, "but they're going to get hammered on taxes. They'll lose 40% of their net worth to the government, just like that."

"No, they won't," I say. "They aren't paying any taxes."

"Say what?" He lifts his chin off his mittens for the first time in a while, reinvigorated by the chance to tell me how wrong I am. "Their cash basis is only $10,000—you think the IRS won't notice $20 million in capital gains?"

"We didn't invite the IRS," I tell him. "It's none of the IRS's damn business."

"They have ways to make it their business."

"Not any more. Mom and Dad aren't selling their stock for dollars, Joe."

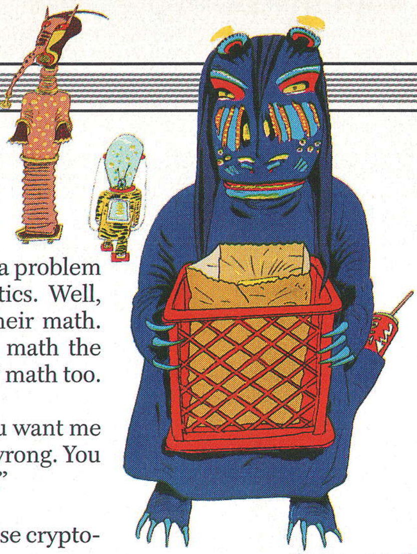
"Simoleons? It's the same deal with Simoleons—everything gets reported to the government."

"Forget Simoleons. Think CryptoCredits."

"CryptoCredits? What the hell is a CryptoCredit?" He stands up and starts pacing back and forth. Now he's convinced I've traded the family cow for a handful of magic beans.

"It's what Simoleons ought to be: E-money that is totally private from the eyes of government."

"How do you know? Isn't any code crackable?"



"Any kind of E-money consists of numbers moving around on wires," I say. "If you know how to keep your numbers secret, your currency is safe. If you don't, it's not. Keeping numbers secret is a problem of cryptography—a branch of mathematics. Well, Joe, the crypto-anarchists showed me their math. And it's good math. It's better than the math the government uses. Better than Simoleons' math too. No one can mess with CryptoCredits."

He heaves a big sigh. "O.K., O.K.—you want me to say it? I'll say it. You were right. I was wrong. You studied the right thing in college after all."

"I'm not worthless scum?"

"Not worthless scum. So. What do these crypto-anarchists want, anyway?"

For some reason I can't lie to my parents, but Joe's easy. "Nothing," I say. "They just wanted to do us a favor, as a way of gaining some goodwill with us."

"And furthering the righteous cause of World Panarchy?"

"Something like that."

Which brings us to Super Bowl Sunday. We are sitting in a skybox high up in the Superdome, complete with wet bar, kitchen, waiters and big TV screens to watch the instant replays of what we've just seen with our own naked, pitiful, nondigital eyes.

The corporate officers of Simoleons are there. I start sounding them out on their cryptographic protocols, and it becomes clear that these people can't calculate their gas mileage without consulting Raster, much less navigate the subtle and dangerous currents of cutting-edge cryptography.

A Superdome security man comes in, looking uneasy. "Some, uh, gentlemen here," he says. "They have tickets that appear to be authentic."

It's three guys. The first one is a 300 pounder with hair down to his waist and a beard down to his navel. He must be a Bears fan because he has painted his face and bare torso blue and orange. The second one isn't quite as introverted as the first, and the third isn't quite the button-down conformist the other two are. Mr. Big is carrying an old milk crate. What's inside must be heavy, because it looks like it's about to pull his arms out of their sockets.

I sense another avatar, something big and shaggy, sidling up next to me

"Mr. and Mrs. De Groot?" he says, as he staggers into the room. Heads turn towards my mom and dad, who, alarmed by the appearance of these three, have declined to identify themselves. The guy makes for them and slams the crate down in front of my dad.

"I'm the guy you've known as Codex," he says. "Thanks for naming us as your broker."

If Joe wasn't a rowing-machine abuser, he'd be blowing aneurysms in both hemispheres about now. "Your broker is a half-naked blue-and-orange crypto-anarchist?"

Dad devotes 30 seconds or so to lighting his pipe. Down on the field, the two-minute warning sounds. Dad puffs out a cloud of smoke and says, "He seemed like an honest sloth."

"Just in case," Mom says, "we sold half the stock through our broker in Bismarck. He says we'll have to pay taxes on that."

"We transferred the other half offshore, to Mr. Codex here," Dad says, "and he converted it into the local currency—tax free."

"Offshore? Where? The Bahamas?" Joe asks.

"The First Distributed Republic," says the big panarchist. "It's a virtual nation-state. I'm the Minister of Data Security. Our official currency is CryptoCredits."

"What the hell good is that?" Joe says.

"That was my concern too," Dad says, "so, just as an experiment, I used my CryptoCredits to buy something a little more tangible."

Dad reaches into the milk crate and heaves out a rectangular object made of yellow metal. Mom hauls out another one. She and Dad begin lining them up on the counter, like King and Queen Midas unloading a carton of Twinkies.

It takes Joe a few seconds to realize what's happening. He picks up one of the gold bars and gapes at it. The Simoleons execs crowd around and inspect the booty.

"Now you see why the government wants to stamp us out," the big guy says. "We can do what they do—cheaper and better."

For the first time, light dawns on the face of the Simoleons CEO. "Wait a sec," he says, and puts his hands to his temples. "You can rig it so that people who use E-money don't have to pay taxes to any government? Ever?"

"You got it," the big panarchist says. The horn sounds announcing the end of the first half.

"I have to go down and give away some Simoleons," the CEO says, "but after that, you and I need to have a talk."

The CEO goes down in the elevator with my brother, carrying a box of 27 smart cards, each of which is loaded up with secret numbers that makes it worth a million Simoleons. I go over and look out the skybox window: 27 Americans are congregated down on the 50-yard line, waiting for their mathematical manna to descend from heaven. They are just the demographic cross section that my brother was hoping for. You'd never guess they were all secretly citizens of the First Distributed Republic.

The crypto-anarchists grab some Jolt from the wet bar and troop out, so now it's just me, Mom and Dad in the skybox. Dad points at the field with the stem of his pipe. "Those 27 folks down there," he says. "They didn't get any help from you, did they?"

I've lied about this successfully to Joe. But I know it won't work with Mom and Dad. "Let's put it this way," I say, "not all panarchists are long-haired, Jolt-slurping maniacs. Some of them look like you—exactly like you, as a matter of fact."

Dad nods; I've got him on that one.

"Codex and his people saved the contest, and our family, from disaster. But there was a quid pro quo."

"Usually is," Dad says.

"But it's good for everyone. What Joe wants—and what his client wants—is for the promotion to go well, so that a year from now, everyone who's watching this broadcast today will have a high opinion of the safety and stability of Simoleons. Right?"

"Right."

"If you give the Simoleons away at random, you're rolling the dice. But if you give them to people who are secretly panarchists—who have a vested interest in showing that E-money works—it's a much safer bet."

"Does the First Distributed Republic have a flag?" Mom asks, out of left field. I tell her these guys look like sewing enthusiasts. So, even before the second half starts, she's sketched out a flag on the back of her program. "It'll be very colorful," she says. "Like a jar of jelly beans." ■

HE'S DESTROYING HIS OWN RAINFOREST. TO STOP HIM, DO YOU SEND IN THE ARMY OR AN ANTHROPOLOGIST?

In the Amazon, some native peoples are felling their forest for cash.

(In one case, for the price of 15km of road and a car to run on it.)

In Columbia, it's been known for some tribes to issue logging licences for their own land.

It's no different in the Monte Pascoal national park in Brazil either.

Here local timber merchants have given the Pataxo people chain saws and encouraged them to cut timber.

Yet everyday the readers of papers and magazines like this one are inundated with appeals to save native peoples.

Do they really deserve our support?

The answer is yes.

The truth is, they are not the problem. They're the victims.

In the last century outsiders have bestowed some dubious gifts on them.

Smallpox, tuberculosis, measles to name three.

To the list can now be added greed and corruption.

Many governments have a vested interest in the destruction of the forests.

Saddled with huge debts, logging provides a quick financial fix. So much better if the native peoples can be persuaded to help.

So some Indians are confused and demoralised. Duped into selling land, they become unwitting accomplices to the forests' disappearance.

The only army that can stop this is an army of concerned people. What can we do?

We're WWF - World Wide Fund For Nature.

Our conservation scientists and anthropologists work to discover ways in which forest management makes economic and ecological sense.

A study in the Peruvian Amazon, showed that harvesting fruits, oils, rubber, medicinal plants, and forest products like rattan produced seven times as much income as intensive logging.

Another survey found that fruits and latex from the forest were worth nine times more than timber.

It seems so simple.

Yet only 0.1% of the tropics' productive forests are used in this way.

The need is to lobby governments.

The need is to work with native peoples to develop conservation techniques.

We've already started working with the Kayapo. This programme has proved that, without interference, their traditional agricultural methods can improve the soil they cultivate.

In Peru, WWF co-operates with the Yanesha people. Here trees are only harvested if it encourages the growth of new saplings. WWF provides financial support and assistance on over 100 tropical forest projects like these.

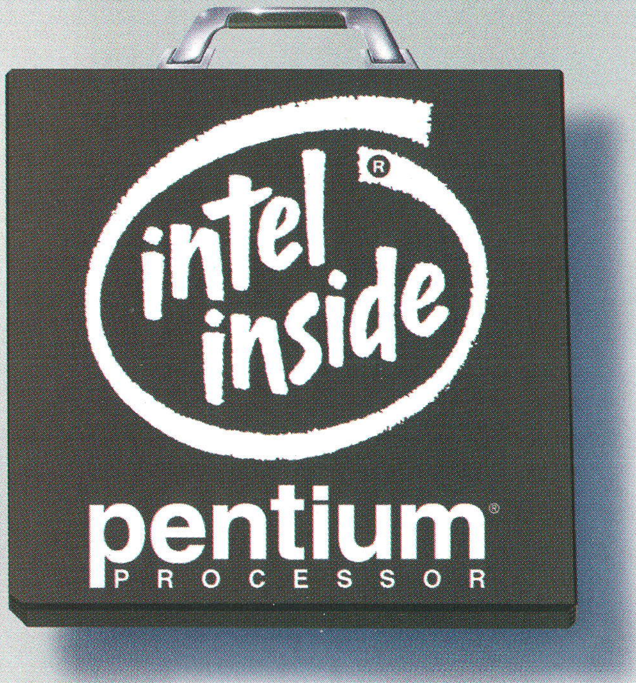
Of course, we don't have a bottomless well of money to play with. If you can make a donation or legacy, we'd be grateful. What is at stake is the future of the forests and their peoples.

On average, one Amazonian tribe has become extinct every year this century.

Enough is enough.

WWF

World Wide Fund For Nature
(formerly World Wildlife Fund)
International Secretariat, 1196 Gland, Switzerland.



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